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The most efficient and modern methods for cleaning and sanitizing school facilities are presented for the benefit of school custodians. Careful attention to the total school environment can be supportive of the general education program and at the same time make a sound contribution to the health and health education. Topics discussed include--(1) orientation and definitions, (2) basic bacteriology and chemistry, (3) cleaning and sanitizing methods, and (5) pest control. A bibliography is provided. (RK)

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sanitation in school housekeeping

RESOURCE MANUAL

CUSTODIAL TRAINING COURSE

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STATE DEPARTMENT OF EDUCATION, FLOYD T. CHRISTIAN, SUPERINTENDENT
TALLAHASSEE, FLORIDA

SANITATION IN SCHOOL HOUSEKEEPING

A
TRAINING COURSE
FOR
SCHOOL CUSTODIANS

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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FOREWORD

It has long been an accepted fact that every effort must be made to protect the health of the school pupil and teacher. Careful attention to the total school environment can be supportive of the general education program and at the same time make a sound contribution to the health and health education. A school maintained free from dirt and filth will be freer from bacteria and vermin which can transmit disease. A clean environment is conducive to a cheerful outlook by school children, and in turn promotes an effort on their part to maintain the standards of cleanliness.

Today, with the number of pupils and staff increasing in each of our schools, and with the school plant being utilized more during the school year both for educational and extra-curricular activities, the problem of achieving proper sanitation of the facilities becomes more acute. One of the better ways of solving the problem is to train the personnel directly responsible for the cleaning and sanitizing in the most efficient and modern methods for sanitizing. A well informed employee makes a better worker. A better understanding of the overall responsibility of the school to the pupil will also aid in building motivation in the school custodian.

It is hoped that this course will help the school custodian accomplish his work easier and more expeditiously and with a greater understanding of the importance of sanitation in the school.

The objectives of this training course are:

1. To develop a better understanding on the part of the school custodian for the need for the highest standards of sanitation.
2. To increase the custodians' knowledge of the many different types of materials and equipment available to aid him to maintain a sanitary school plant.
3. To teach the custodian the proper use of materials and equipment so that he might avoid endangering the health of the pupils, the facilities and himself.
4. To teach the custodian the skills necessary to accomplish sanitation in the shortest length of time.
5. To demonstrate some of the standards of sanitation which have been developed by other schools.
6. To increase the knowledge and ability of the custodian in evaluating the materials and equipment provided him.
7. To develop the desire and interest of the custodian in school sanitation and to promote further study of this field in his spare time.

ACKNOWLEDGMENTS

The materials in this manual were prepared by Mr. Luther S. Smith, Coordinator of Custodial and Maintenance Training, with the assistance and advice of Dr. Carroll W. McGuffey, Assistant Director for School Plant Administration, and Mr. Nelson E. Viles, Jr., Consultant, School Plant Management. Information came from many sources including the literature in the field and experience gained while working with the school districts.

Appreciation is extended to the many members of the Florida School Plant Management Association for their encouragement in the development of this manual.

TABLE OF CONTENTS

Page

Foreword i

Acknowledgments iii

Table of Contents v

Chapter

1 ORIENTATION AND DEFINITIONS 1

A. Objectives, Scope, Limitations and Purpose 3

B. Definitions of Terms 4

2 BASIC BACTERIOLOGY AND CHEMISTRY 9

Part 1: Basic Bacteriology for Custodians 11

A. Types of Bacteria, Environment Necessary For Growth 12

B. What Kills Germs 15

C. Choosing a Disinfectant 20

Part 2: Cleaning Agents 31

A. Composition of Dirt 31

B. General Cleaning Agents 32

C. Special Cleaning Agents 40

3 CLEANING TOOLS, FIXTURES AND FIXTURE SURFACES 43

Part 1: Cleaning Tools and Equipment 45

Part 2: Fixtures and Surfaces 67

A. Fixtures 69

B. Surface Finishes 74

Chapter Page

4 CLEANING AND SANITIZING METHODS........................ 85

A. Toilet Rooms.................................. 87

1. Fixtures.................................. 89

2. Floors and Drains.......................... 97

3. Walls and Partitions........................ 99

4. Odor Control.............................. 100

5. Sequence to Follow.......................... 101

6. Frequency of Servicing........................ 102

7. Standard Cleaning Times...................... 102

B. Drinking Fountains.............................. 103

C. Locker Rooms.................................. 105

D. Shower Rooms.................................. 107

E. Cafeteria.................................... 107

1. Eating Area.............................. 108

2. Food Preparation Area........................ 109

3. Waste Disposal Area.......................... 110

F. Clinic or Health Room............................ 113

G. Sweeping.................................... 114

H. Dusting...................................... 120

5 PEST CONTROL.................................... 129

A. Reasons for Control.............................. 131

B. Harborage for Pests.............................. 131

C. Chemical Control of Pests.......................... 132

D. Physical Control of Pests.......................... 138

Appendix A -- Chart: Actual Use Cost of Diluted

Concentrate.................................... 141

Bibliography.. 145

CHAPTER 1

ORIENTATION AND DEFINITIONS

CHAPTER 1

ORIENTATION AND INTRODUCTION

This entire course is designed to help you gain a basic knowledge and understanding of the field of sanitation in school housekeeping. In it we touch on the many different branches of sanitation that pertain to the school plant. This course could last for many weeks if we went deeply into theory and spent enough time in practical application so that each of you became thoroughly familiar and proficient in each step, but we realize that this time is not available. We are forced to limit our time and divide it between discussion, demonstrations and practical application on your part. We will show you also where you can find additional material that you can study at your convenience and in a manner most suited to your particular plant.

Our specific objectives are as follows:

1. To familiarize you with the basic terminology used in the field of sanitation.
2. To teach some basic principles of bacteriology and how they are used in your daily work.
3. To give some basic concepts of the chemical make-up and the use of the more common cleaning and sanitizing products on the market.
4. To demonstrate some of the many hand tools and equipment available to you and how their use can help ease your work.
5. To give a brief analysis of the different types of surfaces to be cleaned and special instructions for each one.
6. To show you the latest methods for cleaning and sanitizing specific areas.

7. To discuss some specific problems encountered in these areas and their remedy.
8. To discuss the problem of pests and how you can control them.

This manual will serve as the basic text for this course. As you will note by looking through it, it is compiled from many sources. In gathering the information contained in it, we have borrowed from the source we felt was best suited for our purposes only after comparing all available information.

The course will consist of ten classroom hours. Questions and comments from the class are invited. Feel free to ask a question any time you do not understand the instructor.

There will be a short quiz at the end of each session so that you can see if you have learned the main points. In addition, at the end of the course you will take a final examination covering the entire course. Successful completion of this course will entitle you to a credit of ten hours toward certification by the state. The titles of the other courses will be announced as they are ready for presentation. Your individual record of successful completion of each of the courses will be kept on record to form the basis for later awarding of a certificate of "State Certified Custodian".

Definitions

The following are definitions of some of the terms that you will encounter in this course:

ABRASIVES	Any material used for grinding, wearing or rubbing off.
ALGAE	Tiny one-celled plants which appear as green scum in swimming pools or stagnant water. Algae make food in their own body while bacteria cannot.

ALGICIDE	Any agent which will kill algae.
ANTISEPTIC	A substance which destroys germs in living tissue. You would use an antiseptic to kill germs on a wound, for example.
BACTERIA	One celled micro-organisms. They are often disease carriers and live and multiply in filth, dirt, and rotting or fermenting material.
BACTERIOCIDE	Any agent that will kill bacteris.
BACTERIOSTAT	Any agent that will prevent the further growth of bacteria, not kill them.
CORROSION	Eating or wearing away slowly by chemical action, like rusting.
DAMP MOPPING	Mopping with a moist mop only -- not wet.
DETERGENT	Any agent that will clean -- including plain water.
DISINFECTANT	Any agent that kills bacteria that cause infections. Usually the word disinfectant means the same thing as the work germicide or bacteriocide.
DISPERSION	The breaking up of dirt into very small particles.
EMULSION	Tiny drops of grease, fat or oil held evenly in distribution and suspension in water.
FILLER	A substance used for increasing bulk or volume, see INERT INGREDIENTS.
FUNGICIDE	An agent for killing fungi, like rust or mold.
GERMICIDE	An agent for killing germs, especially those which cause diseases. Bacteria are one type of germs.
GLAZED	A glass-like surface which is produced by firing in a kiln at very high temperatures.
HARD WATER	Water which contains many minerals which interfere with the action of soap and which leaves a deposit. Example: lime deposit in a tea kettle or hot water tank.
HERBICIDES	An agent which kills weeds and plants.
INERT INGREDIENTS	Those ingredients in a product which do not have an active part in the products main job. They are either a "carrier" for the active ingredients or "make weight" bulk.

INSECTICIDE	A product (usually spray or powder) used to kill insects.
NEUTRAL CLEANER	One neither alkaline nor acid. However, authorities usually consider a cleaner neutral if on the alkaline side not more than 0.15%. In fact, a trace of alkali is desirable to keep the product stable. Those cleaners sold as neutral have a pH range of 7.0 to 9.9.
PATHOGENIC	Bacteria which cause disease. Non-pathogenic would then be those bacteria which do not cause disease.
PENETRATION	The ability of some detergents to penetrate down into and through a layer of soil, dirt, grease, etc., into tiny cracks.
pH SCALE	The measure of acidity or alkalinity of a solution, ranging from a pH of 1 to 14, with 7 being the mid-point (neutral). Distilled water has a pH of 7. All solutions with a rating of less than 6 are acidic in nature while those above are alkaline. Detergency usually increases with the pH rating, but according to the American Medical Society, a solution having a pH rating above 10.5 is too harsh on the skin for general use.
PHENOL COEFFICIENT	A rating indicating a solution's disinfecting ability relative to carbolic acid,(Phenol). The higher the number, the more the product can be diluted and still be effective. The number itself does not indicate the product's germ killing strength, but its concentration. Since a 5% solution of carbolic acid is used as the standard, a product may usually be diluted 20 times its phenol coefficient without losing its effectiveness.
RODENTICIDES	Agents used for the poisoning of rats and mice.
SANITIZE	To greatly reduce the number of germs on a surface. Sanitizing does not get rid of all germs, but it kills so many that the surface is relatively safe.
SEMI-VITREOUS	A kiln-fired surface (like tile) having a moisture absorption of approximately 3.0% to 7.0% by weight.
SLOAN VALVE	A common name for a flushometer valve used on commodes and urinals and which flushes with water direct from the supply line. It is adjusted to allow a given amount of water to flush through and then shut off. Sloan is a brand name, but it is so well known most custodians use it to denote all flushometer valves.

SOAP	A detergent made from animal or vegetable fats and oils and alkaline earth metals. Can be liquid, solid, powder, jelly or paste, granule, or flake in form.
SOLVENTS	Strong organic chemicals which clean by solubilizing action rather than emulsification, penetration, wetting, etc. Good for specific applications, they require expert handling and are often a fire and health hazard. Even small amounts will completely destroy painted walls, floor tile and a great many plastics.
SYNTHETIC DETERGENT	Organic chemicals derived from modified petroleum products and synthesized materials. Synthetic detergents are replacing many of the soaps for many cleaning jobs.
STERILIZE	To render completely free from all living bacteria. Complete sterilization is very difficult to achieve, but is necessary in certain places, like hospitals and laboratories.
SUSPENSION	Holding of dirt particles up in a cleaning solution and not allowing them to settle back out of it.
VITREOUS	A term usually connected with kiln fired tile, meaning to have a moisture absorption of approximately 0.5% to 3.0% by weight.

CHAPTER 2

BACTERIOLOGY AND CHEMISTRY

8/9

PART 1

BACTERIOLOGY

Bacteriology is the study of germs or bacteria. In your case, this information will deal mostly with how germs grow and spread in schools.

This lesson will also tell you what bacteria are and will give you a few simple steps that you can follow in your work to stop bacteria from spreading.

Bacteria are actually tiny, invisible plants, members of the fungus family. They cannot combine air with water to make their food inside their own bodies as other plants do. For this reason, they must live in the presence of higher forms of plant and animal life. They are also present on all foodstuffs.

The bacteria are the smallest and simplest of the fungi. A million of them could be placed on the head of a pin. Each bacterium is a single cell -- little more than a tiny particle of jelly. However, bacteria come in a variety of shapes and sizes, as you could see if you had a microscope. That's how we can tell them apart and can trace the diseases that the different kinds of bacteria cause.

Not all bacteria are dangerous, but many of them are. You will be especially concerned with killing the dangerous kinds -- or at least preventing them from growing.

It would be impossible to list all of the diseases bacteria cause, but these are some that you may know about:

pneumonia
tuberculosis
tetanus
typhoid fever
tularemia
syphyllis
diphtheria
boils
cholera
infections
whooping cough
scarlet fever
epidemic meningitis
ptomaine food poisoning

Some of the different types of bacteria and their common names are:

Medical Name	Common Name
Salmonella Typhosa	Typhoid fever
Shigella paradysenteriae	Dysentery
Salmonella schottmoelleri	Paratyphoid
Eschericia coli	Colitis
Micrococcus pyogenes various aureus	Skin infections, boils, miningitis, Infectious diseases such as scarlet fever, erysipelas, bacterial endocarditis
Mycobacterium smegmatis	Genital discharge
Mycobacterium tuberculosis	T. B.
Fungi:	
Trichophyton interdigitale	Athlete's foot
Lenzites trabea	Wood rotter
Ceratosomella pillifera	Wood rotter
Penticillium glaucum	Common mold
Glomerella cingulata	Plant pathogen
Aspergillis niger	Black mold

Bacteria grow because they find food and favorable conditions in certain places. Bacteria feed on the same basic substances that we human beings feed on. Because they are so small, a tiny speck of such a substance may feed millions of bacteria. Wherever bits of dirt and moisture gather, bacteria grow. When dirt and bits of moisture are scattered from place to place, the bacteria scatter with them.

Actually, the human body is a wonderfully fine place for bacteria to grow and thrive. You probably carry more millions of bacteria in your body than could be counted, even if you are quite healthy. Each time you breathe out, you send them into the air. Each time you cough or sneeze, bacteria are released from your body by the millions.

Everything you touch receives some bacteria from you. If you happen to be near another human being who may not be in as good health as you are, your bacteria may enter him and grow much faster in his body. This can cause illness and even death. A healthy person can be a carrier who delivers bacteria to others without ever being sick himself.

The basic types of bacteria are:

1. Cocci (the plural of coccus) --- these are round shaped bacteria who sometimes cluster together. They are found in boils, infections, and in food poisoning. Hospitals are now having a serious problem fighting Staph, which is one of this type. Its full name is Staphylococcus aureus.

2. Bacilli (the plural of bacillus) --- these are rod-shaped, like a cigarette. This kind causes typhoid fever, tuberculosis, and other serious diseases.
   There is one special problem in trying to kill bacilli. When conditions are not favorable to their survival, they often form into hard, resistant bodies known as spores. This enables them to withstand heat, drying, or cold to a greater extent. A disinfectant which kills spores is necessary where bacilli may be present.

3. Spirillae (the plural of spirillum) --- these are spiral shaped bacteria. They are something like a cork-screw in appearance. Syphyllis is caused by a spirillum. So is cholera.

All of these three types are called pathogens --- which means, something that causes diseases.

There are other types of bacteria that are not dangerous. The killer type of bacteria described above is merely one form. There are other bacteria that are healthful -- they are necessary to producing butter, cheeze, pickles, buttermilk, and alcoholic beverages.

Still another type of bacteria are those that are neither good nor bad. They are said to be benign, and have no effect on human life. And lastly there is a type of bacteria which is simply called undesirable. They do not kill anyone, but they do plenty of mischief --- they spoil food, create bad odors and so on.

There are certain other one-celled plants that are not exactly bacteria. Some molds can cause disease, but most are harmless, or even good. If moldy foods are eaten, it is not believed by scientists that they can cause illness. Penicillin, the wonder drug that has brought so many benefits to mankind, is actually a mold. It kills bacteria, and led to the discovery of many other molds that kill bacteria.

Algae are tiny one-celled plants, too, and appear as a green scum in swimming pools or stagnant water. Algae are able to make food in their own bodies, like plants. This is what makes them different from bacteria. Algae can be killed with disinfectants, however.

Another common one-celled plant is yeast. It is larger than a bacterium. As you know, it's necessary in the bakery and brewery industries.

You've probably heard the word virus quite often. Viruses are the causes of many illnesses, such as polio. A virus belongs to neither the plant nor the animal kingdom. It is a kind of chemical compound of the protein type. It has no cell structure, and it's no more alive than the protein contained in a steak. Viruses cannot grow, but under certain conditions in a living body they appear to have the ability to reproduce. They can be destroyed by disinfectants. Very little is known about viruses at this time.

BACTERIA NEED FOUR THINGS IN ORDER TO LIVE:

First, they need food. They usually eat the same food or food elements that human beings do. They live on meat, milk, vegetables, blood, etc.

Second, they need moisture. They cannot live or multiply if moisture is absent.

Third they need some heat. The best condition for bacteria to grow in is a temperature between 90° and 100° F. Since the human body is normally at 98.6°F, this is a favorable place for bacteria to grow. High heat kills bacteria. Great cold retards their growth -- this is why we refrigerate foods to keep them from spoiling.

Fourthly, bacteria need darkness. Direct sunlight kills them. They grow best in a condition with little or no light.

When a bacterium has plenty of food, it grows larger and larger, and then divides in two. Thus there are two complete bacteria where only one existed before. As long as there is plenty of food, each of these new bacteria will divide again and again. Where conditions are favorable for growth, a single bacterium cell will divide once every thirty minutes. At the end of 36 hours, one bacterium could produce enough "children" to fill several 5-ton trucks! Fortunately, the food supply required to support this rate of reproduction doesn't exist.

How may bacteria be killed?

There are four general classifications of disinfecting agents.

1. Sunlight and fresh air. Experiments emphasize the fact that no chemical disinfectant of any sort is better than plain ordinary fresh air and sunlight.
2. Heat and cold. Dry heat at about 300 degrees F. for an hour or steam under 15 pounds pressure at 250 degrees F. for five minutes (called sterilizing) destroys bacteria. Sterilizing is effective for clothing and other articles that may be treated without harm to the materials.

   Cold is fatal to some bacteria and retards growth of others. Heat and cold are effective for some purposes, however, their use is limited.

3. **Electrical appliances.** An ultraviolet lamp renders the air sterile for practical purposes. It has been used in many different ways, such as in sterilizing air in toilet rooms and in other rooms for some types of insect control, but its rays are directional and are not as powerful as direct sunlight.

4. Chemical preparations. The idea that inanimate objects could be freed of harmful germs by exposure to a chemical solution was first put into practice by Lord Lister, the founder of aseptic surgery. It was in the 1870's that he began to immerse surgical instruments in a solution of carbolic acid -- a solution he soon replaced with the less corrosive mercuric cyanide. A few years later in 1882, von Bergman, a German surgeon, firmly established the principle of disinfection by chemically disinfecting instruments with a solution of bichloride of mercury.

As knowledge in the field of disinfection accumulated during the next few years, however, it became clear that the chemical method had serious shortcomings. The technical pitfall responsible for this false sense of security was "bacteriostasis", the retarding of bacterial growth by a chemical, usually in very low concentration, without causing actual death of the cells. At the same time that the limitations of chemical disinfection were coming to light, the use of heat in the disinfection process advanced rapidly, resulting in the discovery that true sterilization could be accomplished in a matter of minutes by drastic procedures such as steam under pressure and dry heat at somewhat higher temperatures. This method is preferred by the medical profession due to its certain kill and low cost, but is impractical for institutional disinfection.

Despite the shortcomings of the chemical method and the tremendous value of heat sterilization, the practice of chemical disinfection kept on growing. The reasons this occurred are the same ones that are responsible for its widespread use today. First, it is convenient to use, and there is a need for it because many materials are damaged by heat sterilization. Moreover, chemists over the years have produced many new disinfectants that are more effective than the old carbolic and mercuric compounds.

Chemical disinfection is a controversial subject in the sense that all during its history contradictory statements have been made about the value, or lack of value, of one disinfectant or another. And there is no general agreement today as to the best product to use for any one of many specific applications. A major factor contributing to the confusion in this field is the irresponsible way some brands of disinfectants are advertised and otherwise promoted. Claims, direct and implied, are made without adequate proof. This kind of salesmanship is reminiscent of patent medicine days when each product was a cure-all, good for everything from fallen arches to baldness. And there is another resemblance. At the present time we are faced with an array of "all-purpose germicides". Probably the pressure for producing all-purpose germicides comes from the consumer. It is safe to say that no single chemical presently available can possibly qualify as the "ideal" disinfectant; nor is one likely to appear in the foreseeable future.

To use chemical disinfection properly one must understand the principles that control it. Let us discuss briefly the three major ones. The first is that strong chemical solutions kill bacteria by coagulating or "cooking" their protein. Therefore, they act the same way heat does; just as a high temperature kills more rapidly than a lower temperature, so a strong concentration kills more rapidly than a weak one. It follows, then, that we should use the strongest concentration we can.

This point leads us to the second principle of chemical disinfection, which is that the capacity of disinfectants to damage surfacing materials limits their maximum usable concentration. This principle takes on meaning when we ask: how rapidly can we disinfect a surface or object without damaging it?

Let's consider the last part of that question first. Strong sulfuric acid is rapidly deadly to bacteria, but it is also highly corrosive; and when it is diluted to a point where it does not corrode, it is no longer lethal. Therefore, sulfuric acid is not a disinfectant. On the other hand, a quaternary ammonium compound is a disinfectant because it is actively bactericidal in a concentration which does not damage inanimate objects.

We are ready now to consider the first part of the question -- "how rapidly can we produce disinfection?" This brings us to the third and most important principle, which is that the time required for complete disinfection-- referred to as "disinfection time" -- depends upon three factors: (1) the nature of the object or material being disinfected, (2) the nature of the contamination or type of germs, and (3) the effectiveness of the chemical as a "cidal" agent.

Some objects can be disinfected more readily than others. The type of object that can be disinfected most easily is one with a flat, smooth, hard surface. The disinfection of porous and uneven surfaces requires good penetration of the disinfectant.

The second factor affecting the disinfection time is the nature of the contamination, in other words, the make-up of the bacterial population which must be destroyed. There are two aspects to this, the total number or population size, and the types of bacteria in that population. Both exert a significant effect, but the bacteria type is the more important.

For purposes of chemical disinfection, bacteria fall into three classes with increasing resistance in the order given: (1) nonsporulating, vegetative bacteria such as staph, strep, and E. Coli; (2) the tubercle bacillus; and (3) spores. The difference between class 1 and 2 is not great, but that between class 1 and class 3 is enormous. For example, the vegatative for the tetanus bacillus is destroyed in a few seconds by a chemical solution that fails to kill the tetanus spores in days or even weeks of exposure.

This brings us to the meaning of the word "disinfectant". This term has not always meant the same thing. As our knowledge grew and the standards rose over the years, the word "disinfectant" became more and more inclusive. This point can be best illustrated by a 3 point question. When you set out to disinfect a surface with a chemical solution, do you intend to kill just the vegatative bacteris? or the vegetative bacteria plus tubercle bacillus? or these two plus all spores?

Until a few years ago there was general agreement that a disinfectant needed to kill only the vegetative bacteria and some of the pathogenic fungi. More recently, however, it has become customary to expect tuberculocidal action. At present it is also to be expected that certain viruses will also be destroyed. But very few chemicals or combinations of chemicals can kill spores in the length of time that is practical. Therefore, disinfection does not include the killing of spores. The distinction between disinfection and sterilizing now becomes more clear. The process of disinfection may or may not kill all forms of microbial life contained in the articles so treated, but the process of sterilizing must guarantee that this occurs.

We mentioned earlier that the disinfection time was influenced not only by the type of bacteria in the contamination, but also the population size. The larger the number, the greater will be the time required to kill the last resistant cells in the population. The reason for this is a genetic one. In any biologic population the individual members are different in their response to any given situation. And so it is with bacteria and their resistance to chemicals. When the number is large, the proportion of highly resistant cells is correspondingly greater than it is when the population is small. When the number is enormously large, there may be present a few extraordinarily resistant cells that can be destroyed only by a very long exposure. How long should the surface be exposed to the disinfectant solution? The answer will vary in each instance, but usually the greater the contamination, the longer the disinfection time.

When selecting a disinfectant, the safe way when one has little knowledge of the product, is to rely upon long-established concerns and follow their recommendations. In other words, use "brand name" products which have a good reputation. In addition, there is reason to expect better standardization of methods and more rigid control by federal agencies of advertising claims in the future.

We are now ready to consider the third factor which influences disinfection time, namely the bactericidal effectiveness of the chemical itself. Hundreds of different germicidal solutions have been made available; some are better than others. From data gathered from many sources we will comment in a general way about some of the more common types used in school housekeeping:

(A) Synthetic Phenols -- These are chemical compounds that have only been developed in modern times. First, it should be explained that the word "phenol" means carbolic acid. For years, carbolic acid was the most widely used disinfectant. But it had many disadvantages and was quite dangerous to human beings. Therefore, synthetic phenols were developed that would be safe to humans. Better still, the synthetic phenols are extremely powerful -- much more so than carbolic acid.

The advantages claimed of synthetic phenols are these: Most of them are odorless. They are not corrosive to mop buckets. They have high disinfectant power. (You can usually dilute them with a considerable amount of water -- sometimes 80 to 1, or even 250 to 1.) They kill many different kinds of bacteria. Some of them are also suitable for use in controlling higher types of fungus, such as the "athletic foot" fungus. They can be combined with cleaners, thus you can clean and disinfect in a single operation. They are usually combined with soap, although there are some products where they have been combined with a detergent.

However, there are also some disadvantages, according to other authorities. They feel that while phenols pass all the accepted germicidal tests, they have definite shortcomings as efficient cleaners in themselves, and have a tendency toward being toxic. In other words, they are readily passed by the pathologist, but the custodian soon complains about hand irritation, discoloration of plastic vessels, etc. These authorities feel that when the phenol is kept low enough so that it is non-irritating, phenols cannot be diluted enough to make an efficient and economical cleaner. When the reverse formulation procedure is used, the product makes an excellent disinfectant and cleans properly, but is highly irritating to the eyes and hands, and personnel soon complain. Further, the same sources feel that phenol compounds are not as stable as other disinfectant-cleaner compounds, and when stored for a prolonged length of time often become ineffective.

(B) Iodine -- Iodophors for the most part consist of iodine, loosely complexed and solubilized with a variety of detergents. This is one of the most powerful disinfectants. It even kills the T. B.

germs, which most other disinfectants do not usually kill. It will also kill the polio virus. Iodine is so powerful that less than 1 part in a million is effective in sterilizing water.

Iodophors do not have a strong iodine odor. For many years iodine could not be used widely as a disinfectant because of this odor. The idophors have now made it possible to use iodine widely. Another benefit is that iodophors are not irritating to the skin. They do not corrode mop-buckets as iodine does. Iodophors are recommended where extraordinary disinfectant power is desired. They have the advantage of a self indicator for estimating loss of killing power. In other words, the solution turns from deep amber to yellow or colorless when exhausted.

However, germicidal cleaners with iodophors must be on the acid side having a pH of approximately 3 to 5. Also, care should be taken when using iodophors to see that the surface being treated if free from alkaline residue, for if any exists it will tend to neutralize the iodophors and lower germicidal effectiveness. In addition, there is the objection of using an acid type cleaner because of the damaging effect it may have on certain surfaces. In summary, the iodophor group passes as excellent germicidal agents, but have a tendency toward discoloration, are not effective in alkaline areas, and must be combined with acid type agents.

(C) "Quats" -- This is a chemical slang for a very large group of compounds having soap-like qualities and whose full name is quaternary ammonium compounds. There are approximately 1,600 known quat compounds, however, only a very few are useful in compounding disinfectant-detergent combinations.

The quats are the newest of the disinfectants. They were originally described in 1916. They are effective against almost all germs and exhibit a high activity, especially against Staph. They cannot be compounded with soaps since they are actually a form of synthetic detergent but are extremely suitable when compounded with certain synthetic detergents. Some of their advantages claimed are:

1. They have no odor
2. They are non-toxic
3. They have high germ-killing power
4. They are non-corrosive to most surfaces
5. They are non-staining
6. They are tasteless, so are ideal for dishwashing
7. They can be stored for many months without breaking down
8. They provide excellent odor control
9. Last, and very important, they are not affected by the hardness of the water unless it is extremely hard (over 32 grains of hardness).

(D) Hypochlorite -- These are commonly found in the form of common household bleaches, such as Clorox, Purox, etc. They are fairly good disinfectants, but they have one big disadvantage for use by school custodians: They are used up in the process of killing germs. When they come in contact with waste products or soil, they begin to oxidize that matter. Thus they are used up and eventually cease to kill germs.

Sanitation authorities require that surfaces be cleaned thoroughly with detergent and water before a hypochlorite disinfectant is applied. This means that you have a two step operation -- first cleaning, then disinfecting. Nowadays the hypochlorite is unpopular as a disinfectant in the schools for this reason. It is simpler and faster to use one of the other disinfectants which is combined with the cleaner.

(E) Pine Oil -- Natural pine oil is in itself a fairly weak disinfectant. You must have a high quality (at least 80% pure) pine oil added to your cleaning solution in rather substantial amounts to get adequate killing power. Moreover, natural pine oil is not as effective in killing some germs -- infections (Staph), boils, and others -- as some of the other types of disinfectants. Many custodians make the mistake of trying to judge the germicidal power of a cleaning solution to which they have added pine oil by the strength of the odor. This characteristic odor of pine oil is not a measure of its effectiveness.

How Do You Choose Which Disinfectant To Use?

Some people still measure the killing power of a disinfectant by comparing it to natural phenol. They say that the disinfectant has a "phenol coefficiency" of so much. Phenol coefficient simply indicates a products disinfecting ability relative to carbolic acid. For example, a product having a phenol coefficient of 6 is, generally speaking, six times more active than an equal or like solution of carbolic acid. Here often lies the confusion regarding phenol coefficients, for some immediately assume that a product with a phenol coefficient of 6, 10 or some other figure, is more potent than a product with a phenol coefficient of 1 at the same concentration.

Rather, it is like shooting a man one time in the head with a shotgun from a distance of one foot -- or shooting a man in the head with a shotgun at the distance of one foot six times, when actually the man would be quite dead in either case. The advantage then of having a higher phenol coefficient is the fact that the germicidal agent may be diluted to a higher degree, dependent on its phenol coefficient. Hence, a product having a phenol coefficient of 6 may be diluted six times as much as a product having a phenol coefficient of 1 and achieve the same task. Also, there is one other difference, and this makes the reverse true. That is, if a product with a phenol coefficient of 1 is diluted too much, it will no longer perform. Generally speaking, and this is a rule of thumb, a product may be diluted 20 times its phenol coefficient. Therefore, a product having a phenol coefficient of 1 will perform its task up to 20 to 1, whereas a product having a phenol coefficient of 6 could be diluted to 120 to 1 and still perform the same task from the standpoint of disinfection.

It must also be remembered that most authorities are quick to point out that phenol coefficients are not an absolute index of biological efficiency. When comparisons are made they should be done on the basis of a series of side-by-side tests. This is one of the reasons that the Government highly recommends what is called their use dilution confirmation test in preference to all others. This test has been adopted as the most dependable supporting bacteriological test for determining the disinfectant level of a given material, and is used in conjunction with phenol coefficient, and percent survival tests. The "A. O. A. C. Use-Dilution Test" is a test developed by the Association of Official Agriculture Chemists.

It consists of using the chemical in diluted form to kill bacteria grown in "cultures". A disinfectant must pass the A. O. A. C. test, and its use-dilution is determined by the results of that test.

An ideal chemical disinfectant would have the following properties:

1. Kill a broad range of bacteria rapidly.
2. Be non-toxic to humans and harmless to the skin in use.
3. Be uneffected in its germicidal action by the presence of organic matter.
4. Not be affected by the presence of either alkali or acid.
5. Be stable in storage for long periods of time.
6. Be non-staining and non-corrosive.
7. Have no odor of its own.
8. Possess a good penetrating power.

Needless to say, no one type of disinfectant meets all of these qualifications. Most germs commonly found in our schools will be killed if they come in contact with the right dilution of any of the previously described types of disinfectant. Consider the characteristics of several types to see which ones might fit your local needs. If several types appear to be equally suitable, then a trial period of each might help you decide.

When you buy a disinfectant you should always read the label carefully before using it and follow the directions. The label will tell you the proper use-dilutions. Remember, ALWAYS READ THE DIRECTIONS ON THE LABEL BEFORE USING. It is possible to damage some surfaces by improper use.

Some authorities feel that a disinfectant is not necessary in the daily cleaning of schools, that a thorough cleaning with soap and water will suffice. They feel that the source and carrier of disease germs should be treated instead. However, others feel that the use of disinfectants are an added factor in the prevention of the spread of disease in the crowded schools. N. L. George feels "the school's authorities should require certain disinfectants to be used in cleaning solutions as they are used daily. Door knobs, handrails, and drinking fountains are good examples of items that need daily disinfecting treatment. Occasionally emergency disinfecting of furniture may be required by the school doctor. The flat surface of classroom furniture should then be washed with the stipulated solution, left damp, and allowed to air dry."[1]

Deodorants -- A deodorant is a chemical compound designed to cover up or mask another odor. This is done in one of two ways: either by creating a new odor that is stronger than the original one or by releasing a substance in the air which will numb the odor sensors in the nose and whereby you cannot smell the original odor. A deodorant does nothing more than this; it does not remove the source of the odor nor does it disinfect in any way.

The use of deodorants is usually a waste of the taxpayer's money and a sign of poor custodial service. If the source of the odor is removed, a deodorant is not necessary. In fact, the rules of the State Board of Health and State Department of Education, Chapter XXXI, paragraph 170C-31.09 (12) state: "No deodorants shall be used in toilet rooms. Deodorants are not to be confused with disinfectants or germicides."

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[1] N. L. George, School Custodian Training Manual, page 107

SOME MEN WHO HELPED MANKIND DISCOVER AND CONTROL BACTERIA

Antony Von Leeuwenhoek -- (pronounced LAY-VAN-HOOK) -- This man was born in Delft, Holland, in 1632. He worked as a bookkeeper, then as a haberdasher, and held the position of janitor of the City Hall of Delft.

Leeuwenhoek's hobby was grinding lenses. Because of this, he was one of the first men to develop a workable microscope. Leeuwenhoek became famous because he discovered tiny little "animals" with his microscope. He took notes on their actions, and began conducting experiments with them. He soon realized that these little "animals", though invisible to man, were present everywhere -- billions and billions of them.

Leeuwenhoek exchanged letters with many famous scientists of his day, even though he himself was not a scientist. In fact, his lack of education and his inability to express himself in "big words" always bothered him. Yet honors were heaped upon him in his lifetime. He lived to be 91, and he proved the existence of bacteria before anyone else.

Robert Koch -- This man was a country doctor in Germany. He was born in 1843. During his lifetime he conducted many experiments to find out what bacteria were and what they would do. He was the first man who proved that germs do cause disease. He also was the first man to prove that a specific kind of germ always causes the same specific disease. For instance, typhoid fever is always caused by a certain small organism and by no other. This may seem rather simple to us, but it had not been proved until Koch himself conducted scientific experiments that settled the question beyond all doubt. Koch also discovered the bacteria that cause tuberculosis and cholera.

Louis Pasteur -- This great French chemist is called the Father of Bacteriology. You probably have heard of pasteurized milk. The process takes its name from Louis Pasteur, who invented it. He showed how it can be used to preserve milk and make it safe to drink.

Pasteur spent his whole life conducting experiments on bacteria. He was the first man to explain what fermentation was and how it worked. He became world famous as a young man when he developed a vaccine to prevent rabies in those bitten by mad dogs. His studies covered such a wide range of problems that he laid the entire foundation of the science of vaccination. He taught how both animals and human beings may be made immune when vaccinated with a small dosage of certain dead germs called anti-toxins.

You might be interested to know that bacteriology is a very young science. Almost everything we know on the subject has come to us in just the past 100 years.

Scientists did not begin teaching bacteriology in American colleges until about 1885. The typhoid germ was discovered in 1880. The tuberculoris bacilli was discovered in 1882, diphtheria in 1883, syphyllis in 1905. The helpful bacterium, penicillin, was found by Dr. Fleming, a British bacteriologist, in the 1930's. It was a wonderful help in saving human lives during World War II.

If you would like to read an interesting book on this subject, you may want to look into "Microbe Hunters" by Paul de Kruif. This is the story of the men who discovered bacteria and learned how human beings can fight them.

PART 2

CLEANING AGENTS

For purposes of discussion, you can define dirt simply as dust that has been mixed with a moisturizing agent, such as oil or water, which makes it stick to a surface. Dirt removal consists of releasing this binder and then removing the loose residue. The "unlocking" of the dirt may be accomplished with many different types of cleaning agents; however, some thought must be placed on which agent is the best one for any particular job. Some agents, while being very effective, will prove harmful to the surface which must be cleaned and the results could be more harmful to the surface than leaving it dirty.

When selecting cleaning agents for your school, you should keep in mind the immediate aim of cleaning and sanitizing and also the ultimate aim of improving instruction as a result of a clean environment. These aims are basically the same for all schools, yet the individual school's cleaning problems will vary. If the problems were the same everywhere, we could select and use standardized cleaning materials throughout the state. But, of course the problems vary. Although we cannot standardize our supplies, we can set up some general criteria which will aid in the selection no matter where we live. Here are some points to consider in selecting cleaning materials:

1. The cleaning power of the material
2. Its ease of use or economy of labor
3. Safety, both to the surface to be cleaned and to the custodian

4. Economy

By keeping these points in mind when purchasing or selecting materials, it will help you when you are choosing the supplies to meet your particular problems.

There is a trend toward standardization of supplies by buying types that are more general purpose in nature and away from a great variety of products. Many school systems purchase in large quantities by chemical rather than brand name and affect considerable economy. Generally, it is safer to buy supplies from a reliable, established sanitary supply house, even though the price may be slightly higher, than from some company whose business reputation may be in doubt. The old saying that "you will get what you pay for" is never more appropriate than when buying supplies.

1. Water

Perhaps the simplest and oldest cleaning agent is water. At times some dirt may be removed with a damp cloth or sponge. However, water does not have the ability to emulsify, or cut, grease and oil as in found in perspiration, body oils, kitchen smoke, cigarette smoke and other types floating around in the air.

2. Soaps

Soap has become one of the most uncommon cleaning materials found around the school. When purchasing soap, keep in mind the principles of cleaning and the different types you will need to buy. They are made from caustic alkalis such as potash or lye, together with fats and oils. The two types of soap are Alkaline and Neutral.

Alkaline soap contains quite a lot of "building" material, such as trisodium phosphate, soda ash, water glass, or other similar substances, to increase the detergency action. Heavy alkaline soaps may contain up to 11% of some such "builder". They can be so harsh as to remove paint and varnish, and can dull finishes. In fact, if they are used on tile floors, they will remove the oil from the tile and it will get brittle and hard and will eventually crack.

Neutral soaps are mild; they contain only about 1% builder. Such soap should be used for cleaning walls, toilet rooms, all types of floors, and any surface which has an oil base paint on it. Most fabrics and plastics require the use of neutral soap.

Some other terms you should understand when discussing soaps and detergents are:

1. Wetting power -- A cleaner added to water will increase its ability to penetrate into the tiny cracks of a soiled surface even faster than water alone.
2. Emulsifying power -- This means the solution has the ability to break up and remove oily particles from the surface and suspend them in the cleaning solution. The solution must also prevent them from coming together again and redepositing themselves back on the surface. If they are broken up finely, the particles can be easily removed by rinsing.
3. Dispersing power -- A cleaning material must have wetting and emulsifying power and in addition, the ability to keep particles in suspension in the cleaning solution, in other words, dispersing power.

No distinct lines can be drawn between wetting, emulsifying and dispersing agents; too many chemicals have one or more of these properties.

If the water in your area contains such minerals as calcium, iron, magnesium, suspended matter, and oil, it is considered "hard water". These materials render part of the soap ineffective and form scum which must be emulsified by the rest of the soap. Cleaning can be done satisfactorily with hard water if a softening agent like soda ash, trisodium phosphate, borax, or some other is mixed with it beforehand or by using a "built" soap which already contains these materials.

Soap is available in bar, liquid, or powder form. Bar soap is most used in lavatories or showers, though the State Sanitary Code forbids its use in public toilet rooms because of the possibility of transferring germs from one person to the other. It may be used in such places as the custodian's work room, the principal's private restroom or some place that is not public. Some schools do not purchase soap in bar form to avoid the possibility that it might be placed in general use.

Liquid toilet soaps are water solutions, usually of a neutral coconut oil potash soap which may have glycerol, sugar, or alcohol added to lower the freezing point and prevent foaming. Sometimes another vegetable oil such as palm-kernel oil or olive oil is substituted for part of the coconut oil. Glycerol is probably unobjectionable since it has softening qualities, but sugar has no beneficial action on the soap itself and may be objectionable because it leaves the hands sticky.

Powdered soaps (which include flake and granulated soaps) may be the small quantity type, like hand cleaning soaps, or large quantity types used for scrubbing. Powdered soaps are made by mixing dry sal soda or borax with liquid soap, dried out, and then milled into a powder. Powdered handsoaps are used in some school restrooms, but you will find the dispensers often become plugged up, the powder falls on the sink and forms a messy paste, it will collect under the fingernails, and in and under rings.

In most schools liquid handsoap is the most desirable for toilet room use. It should be thinned down to about a 10% solution to prevent gumming the dispenser and to save soap. The following table shows how to dilute a 40% liquid handsoap concentrate for various uses.

Directions for Mixing 40% Concentrated Soap for Dispenser Use

Desired Finished Soap	Amount of Ready-To-Use Soap									
	5 Gal.		10 Gal.		15 Gal.		30 Gal.		50 Gal.	
	Soap:Water		Soap:Water		Soap:Water		Soap:Water		Soap:Water	
8% Soap for Elemen. Schools, Public Washrooms	1 Gal	4 Gal	2 Gal	8 Gal	3 Gal	12 Gal	6 Gal	24 Gal	10 Gal	40 Gal
10% Soap for High, Consolidated schools	1¼ Gal	3¾ Gal	2½ Gal	7½ Gal	3½ Gal	11½ Gal	7½ Gal	22½ Gal	12½ Gal	37½ Gal
12% Soap for offices	1½ Gal	3½ Gal	3 Gal	7 Gal	4½ Gal	10½ Gal	9 Gal	21 Gal	15 Gal	35 Gal
20% Soap for shop, vocational, rooms	2½ Gal	2½ Gal	5 Gal	5 Gal	7½ Gal	7½ Gal	15 Gal	15 Gal	25 Gal	25 Gal

Notes: To insure a sparkling clear liquid soap, always use clean distilled water, soft water or rain water.

Always measure the exact amount of soap into a clean container, then mix in the water.

This chart courtesy of Huntington Laboratory, Inc.

Oil or Soft soaps are paste soaps made from certain vegetable oils and caustic potash (or a mixture of caustic soda and caustic potash). The terms "oil soap" and "soft soap" are broad ones. Green Soap is a name frequently applied to oil soap, even though the latter is usually amber in color. Other names for oil soap are potash soap and jelly soap. Oil soaps dissolve easily, are harmless to most surfaces, rinse quickly and leave no residue. Cake, chip, and powdered soaps in general do not have these qualities, or if they do, have them to a lesser degree.

Potash soap does a better job on wood floors than any other soap. It prevents checking and splintering and aids in maintaining the natural resiliency of the wood. A linoleum floor washed with a good grade of oil soap will maintain its new appearance for years, whereas soda soaps will hasten aging and wear.

If oil soap dries on a floor, it remains transparent; soda soaps, on the other hand, form a white film.

Before leaving the subject of soaps, there is one difference that should be made clear: the difference between "soap powder" and "powdered soap". "Powdered soap" is an approximately 88% neutral soap in powdered form. On the other hand, "soap powder" is a strong alkaline soap compound which generally has a high percentage of cheap soda.

3. Synthetic Detergents

"Detergent" actually means any cleaning agent. There are two main types of detergents: the soaps already mentioned and the nonsoaps, which are commonly referred to as "synthetic detergents". Synthetics were originally developed, not because of a scarcity of soap, but to overcome its disadvantages. While soap is a very good general cleaning agent in soft water, it is not so satisfactory when used in hard or cold water. Calcium and magnesium salts in hard water react with soap to form soft, gummy scums which stick to the surface being cleaned. This scum is as difficult to wash off as is the original dirt itself. This means that part of the soap added to hard water is consumed in softening the water, and only after that can the leftover soap do the cleaning for which it is intended. World War II hastened the development and extended the use of synthetic detergents. Nowadays they are more commonly used than ordinary soaps.

Synthetic detergents are not made from a combination of oils, fats, and alkalis. Some are made as a by-product of refining petroleum products, especially kerosene and benezene. Others are made from a group of chemicals called fatty acids. These acids occur in fats and have some of their characteristics, yet are not fats. Synthetic detergents do not form scums, regardless of the hardness of the water.

Light duty detergents are used for cleaning lightly soiled surfaces, for instance, washing dishes and cleaning school lunchrooms. They have a pH value of almost 7. In this group are the commercial detergents such as Dreft, Vel, Breeze and Trend, which give heavy suds.

Heavy duty or all purpose detergents are used for cleaning badly soiled surfaces. They have a pH value considerably above 7. This high pH results from the use of alkaline builders, the phosphates and silicates. In this group are the commercial detergents such as Tide, Fab, Surf and Cheer, which are known as the low-suds group.

Synthetic detergents have some other advantages that the soaps do not. One of these is that they have been approved for use in cleaning rubber. Another is that some of them have been compounded so that rinsing the surface after washing it is almost eliminated. Detergents are available in either powder or liquid form. The liquid has the advantages over the powder of mixing into solution more readily and without having any sediment in the bottom of the cleaning bucket, being easier to measure and generally is less wasteful.

June 30, 1965 is the target date set by the synthetic detergent industry for full production of a new type of synthetic detergent known as "Biodegradable". Called LAS (for Linear Alkylate Sulfonate), this new material will replace the widely used sudsing ingredient called ABS (Alkyl Benzene Sulfonate). ABS decomposes slowly after it has done its job of cleaning and, after it has gone down the drain with waste waters, it can occasionally cause foam on rivers and streams. LAS breaks down in treatment plants as readily as organic sewage.

Although ABS and LAS may sound technical, they are not difficult to understand. ABS, the basic surface-active and foaming agent in most of yesterday's detergents, was not generally broken down completely by bacteria in sewage treatment. Thus at times residues persisted which foamed in waste w waters, streams and rivers.

LAS and "Other Soft" ingredients which are replacing ABS have at least equal cleaning power and do not change the appearance of the product. Because the chemical structure of LAS is more amenable to the action of bacteria, it breaks down rapidly in modern sewage treatment facilities.

4. pH Factors of Soaps and Synthetic Detergents

The acid or alkaline content of a soap or detergent may be rated on a scale known as the "pH Scale". The scale ranges from 1 to 14 in number. Pure water has a pH of 7. It is neutral -- neither acid nor alkaline. pH values higher than 7 indicate greater alkaline content of the soap or detergent, and numbers below 7 show greater acid content. A pH of 1 indicates a very strong acid content, and a pH of 14 indicates a very alkaline condition. So, soaps and detergents with a pH of 7 are neutral and mild, and can be used almost anywhere, while those with higher ratings are harsh and cause the materials upon which they are used to become brittle and hard. They may cause the user's hands to redden and swell or even roughen and chap.

A little change in pH makes a big difference. For example, pH 9 is not just slightly more alkaline than pH 8, but ten times as alkaline, and pH 10 is 100 times more alkaline than pH 8. And while the difference between pH 10.2 and pH 10.4 may seem small, actually pH 10.4 is about twice as alkaline as pH 10.2.

Table of pH Values*

Material	Approximate pH Value	Times as acid (or alkaline) as pure water
Acid		
1% Muriatic acid	1	1,000,000
1% Oxalic acid	2	100,000
Vinegar	3	10,000
Soft drinks	4	1,000
1% Boric acid	5	100
Cow's milk	6	10
Neutral		
Chemically Pure Water	7	1
Alkaline		
1% Sodium Bicarbonate	8	10
1% Borax	9	100
Neutral Liquid Soap	10	1,000
1% Ammonia	11	10,000
1% Trisodium Phosphate	12	100,000
½% Caustic soda	13	1,000,000
4% Caustic soda	14	10,000,000

*Hillyard Chemical Company, "Floor-o-scope", Winter, 1959, page 7.

5. Abrasive Cleaners

Abrasive cleaners contain such materials as finely ground silica (glass or sand), volcanic ash, powdered feldspar, and powdered pumice. They are seldom used alone in cleaning. The continued use of these cleaners can destroy the surface upon which they are used. They may be used to remove particularly stubborn stains and rust from hard surfaces such as tile and porcelain. Abrasives are also used in finely ground form to clean and polish metal. Abrasives should not be used for regular cleaning and their use in special cases should be carefully controlled. Usually the active chemical ingredients contain a powdered synthetic detergent, some "builder" alkali, and some powdered bleaching agent.

6. Others

Trisodium phosphate is a strong cleaning agent for all-around work. One tablespoon full in a gallon of water will serve most cleaning purposes. It is especially good for cutting oil and grease. "TSP" as it is generally called, emulsifies oils and in stronger solutions (two to three tablespoons full to the gallon of water) can be used to clean up heavy grease and to wash dirty oil mops, dusters and dust cloths. It does effect oils, so it may injure linoleum, rubber, and asphalt tile floorings that contain oil. In fact, if the solution is very strong, it will act as a paint and varnish remover.

Bleaches -- The art of chemical bleaching is comparatively new. All bleaching depends on chemical action with oxygen, either the oxygen of the air or oxygen in a chemical solution. Bleaching is the actual removing or destruction of the pigment, not a neutralization of its color.

One form of bleach, Clorox or Purex, (5¼% sodium hypochlorite) is sometimes used as a disinfectant; but, being a hypochlorite, requires the surface to be cleaned before it can work properly as a disinfectant. In addition, bleach can be used as a grout whitener, if a weak solution is mopped on and allowed to dry over a weekend.

Ammonia -- The ammonia we use is a solution of ammonia gas in water. Ammonia is a good grease emulsifier and was used extensively in the past wherever there was a need for removing a heavy grease deposit. The main disadvantages to ammonia are its odor; it is harsh on the hands of the user; and it can damage the surface being cleaned, since it can cut oils and has a bleaching effect. Nowadays there are cleaning agents which have ammonia built into them in a balanced, controlled formula which eliminates guessing as to what amount to use and is easier on the user and the surface to be cleaned. Some custodians still use a few drops of ammonia in water for washing windows.

Special Agents

1. Toilet Bowl Cleaner

Many companies now produce a special cleaner for removing stains and mineral deposits from toilet bowls and urinals. Most of these bowl cleaners are based on an acid which will dissolve the deposits. The acid most widely used is hydrochloric (muriatic), although phosphoric is gaining recognition in some areas. The formula usually has between 20% and 30% acid in it. In addition, detergents, deodorizers, disinfectants and chemicals to "inhibit" the acid action in the pipes are added to the compound. The most common form of bowl cleaner is liquid, though crystals and tablets are also manufactured.

In its action, the acid of the bowl cleaner dissolves the uric salts and mineral deposit buildups, which are basically a form of limestone. Since the porcelain found on wash basins is a limestone deposit on metal, you can see what would happen if an acid bowl cleaner were used on a wash basin. These cleaners will not usually harm the vitreous china used to make commodes and urinals. There are some bowl cleaners which may be used also on porcelain, but you should check the directions on the type you have very carefully before attempting this. All of these compounds are poisonous and must be labeled so. They will damage the skin if left on and will dissolve a hole in any clothing they get on.

2. Germicidal Detergents

A relatively new comer to the market is the germicidal detergent. They are compounded of a detergent for cleaning and disinfectant for killing germs. These agents will eliminate the necessity either for a second disinfecting steop after cleaning, or of trying to mix a proper balance of a disinfectant into the cleaning solution. The improvement in either case is obvious.

The two main advantages of the use of these compounds are: (1) the disinfectant is already in the cleaning solution and in the proper amount, saving bother and avoiding the possibility of neglecting to disinfect; and (2) the cost of the compound, through higher than regular soap or detergent, is usually less than the combined cost of soap plus the individual disinfectant. The disinfectants have been discussed earlier in the course and it is mainly a matter of deciding which type compound will solve your particular problems the best.

CHAPTER 3

HAND TOOLS & FIXTURE SURFACES

PART 1

HAND TOOLS

Proper tools and equipment and their use and care are very important items in cleaning. The provision of standard tools for custodians is a mark of good school administration. The tools and equipment need to be suitable to the needs of the job, of good quality, and efficient. Wages make up 90 to 95% of the cost of cleaning and the custodians need the right kind of supplies to perform efficiently and to avoid waste of the most expensive commodity - labor.

Sweeping Tools

The sweeping tool generally has a handle 60" to 72" long connected to the head of the tool by a double swivel. The head is either a light, short bristled, oval shaped brush to help hold the sweeping tool cover to the floor, or is a solid block type with clips to hold the edges of the cover. This tool is very effective where there is a light soil load but does not have the capacity to carry sand or heavy dirt particles. It is primarily used for floor dusting. The double swivel, sometimes difficult to handle at first, allows a side-to-side motion similar to damp mopping a floor. The head will vary in size, according to the type of floor area used on.

Sweeping Tool Covers

One of two types; either cloth or a non-woven fiber resembling paper. The cloth type is laundered, retreated with a non-oily dressing and reused. The non-woven fiber type is disposable. Some of the cloth type are sewn into a tube for ease in using all sides of the cover; some are the open type.

These covers can be cleaned and treated locally, or an industrial linen service contract company will handle the cleaning and treating. These covers can also double as dust cloths, the treatment in them holding light dust very effectively.

Vacuum Cleaners

A commercial size vacuum has many uses to the school custodian. Such a tool is good for cleaning floors, walls, Venetian blinds, drapes, stage curtains and many other things. The use of a long attachment hose and a ladder extends the use of the vacuum. The unit can be used as a blower to get dirt out of hidden and inaccessible places. There are so many different kinds of attachments for these cleaners that it would be impossible to cover them all at this time. It is best to individually select those attachments that each school can economically use when ordering the basic machine.

Some of the larger schools have found the new light-weight portable industrial vacuums very helpful. These are usually made of magnesium alloy metal parts and plastic elsewhere; they weigh about 10 pounds each. These will have almost the same suction power as the larger models but a much smaller bag capacity and will not pick up water. Always clean out the tank of a vacuum after using and before returning to storage. Even though some of the tanks are stainless steel or heavily enameled, leaving trash in them repeatedly will eventually corrode the tank, especially so if it has been used for water pickup. The filter bag should be taken out, shaken and brushed with a corn broom occasionally otherwise a gradual loss of suction will be noted as fine dust clogs the mesh of the filter. Some of the more expensive hoses have oil and acid resistant linings, but the regular rubber ones will be attacked by oil, acids and strong cleaning solutions, unless rinsed out regularly. Maintenance of the motor in the head is a job for the electrical shop and should not be attempted by the custodian.

Sweeping Mops

Most classroom sweeping is done with a dustless mop. A dustless mop is made with center strands attached to a canvas cover. The normal length of strands is 3 to 4 inches. The canvas cover is fitted onto a wooden block or metal frame with a handle. The sizes of mops commonly used for schools are 18", 24", 36" and 48".

For many years the strands of mop heads have been made of cotton. Recently mops are being made available with the strands made from nylon or other synthetic material. There are several companies manufacturing these mops and each have their own trade name or brand. Mops of this material are more expensive than those made of cotton but they seem to have several advantages. They do a good job of sweeping, they are easier to wash, and they outlast cotton. These new mops need only to be soused up and down in warm (not hot) water in a mop sink and then hung to dry. A few drops of neutral cleaner may be added to the water, but it is not essential. Cotton mops need considerable washing to keep them clean. It is much easier if cotton mops can be put in a washing machine or sent to the laundry.

The metal frame for holding a mop head is thinner than the wooden block frame. Most custodians favor the metal frames because the thinness allows it to go under low furniture. Matrons especially like the metal frame because of its lightness.

A double swivel handle is available on either frame. The double swivel handle allows the handle to fold down either way and provides much more flexibility in the use of the mop. When a custodian starts to use a double swivel handle for the first time it seems very awkward to him. He will often go back to his old mop. After he becomes accustomed to the double swivel, he finds it much easier to do his work.

When a new mop is put into service, it should first be allowed to soak in a solution of warm water to which has been added a few drops of neutral detergent and allowed to drip dry. Following this it can be treated with a dust mop treatment, rolled up, stored in a closed metal container or plastic bag, and allowed to "age" for at least 10 hours before being put to use.

Floor Brushes (Push Brooms)

Floor brushes are made with a number of different materials being used for filling. Hog bristles, although quite expensive, have long been considered the finest brush material. Selected horse hair is used extensively for brushes and in recent years nylon has come into general use. Palmyra brushes are used to sweep areas where a stiff, rigid fiber is needed. Combinations or mixtures of material have been used to good advantage. To some of these mixtures a row or two of fine wares have been added in the center of the brush. Stiff nylon bristles are gaining acceptance for this type also.

Floor brushes are manufactured in variables of 2 inches in length. The standard sizes range from 10" to 36". The most common sizes used in schools are 24" and 36".

The most common use for floor brushes in school custodial work is for sweeping walks and driveways. They are also used in shop areas where there are concrete floors. The nylon brush is good for sweeping walks and driveways because the nylon is slow to wear, it is not effected by water, and it is rigid enough to get into the cracks.

Use of floor brushes in the classroom has been replaced by the use of dust mops in most school districts. The best grade of horse hair does not pick up the fine talcum-like dust which accumulates on finely polished floors as well as do the dust mops. It is interesting to note that the dust mop stirs up less dust and thereby reduces the amount of room dusting necessary. The block in the floor brush has a hole on each side where the handle can be attached. The handle should be changed from side to side each week to insure even wear and longer life for the brush. Some custodians even paint the numbers "1" and "2" on each of these holes, and use number one for the odd numbered weeks of the month and side 2 for the even numbered weeks. Make sure the handles are set fairly tight. Loose handles cause the threads to wear out. When the floor brush is not in use, it should be hung up. If the weight is allowed to rest on the bristles they will be moulded out of shape. Brushes with hair bristles should never be used in water or on wet surfaces. To do so will cause the bristles to mat and thereby reduce their usefulness. Wet floors should be swept with plastic, basseine fiber, palmyra fiber, corn broom brushes, or like material.

If a floor brush has been allowed to curl up from abuse, it can sometimes be improved by applying the following treatment. (1) Comb the bristles. (2) Fill large tub with lukewarm water to which has been added a tablespoon full of TSP per gallon of water. (3) Swish the brush in this solution for about two minutes. (4) Rinse in cold water. (5) Hang the brush up wet without shaking out the water and with the bristles hanging straight down. (6) Allow to dry for several days.

Counter Brush

The counter brush is a very useful custodial tool. After the floor has been swept with a dust mop or broom, a counter brush and dust pan are used to pick up the pile of sweepings. The counter brush is also used for getting into inaccessible places, for dusting the tops of furniture, and the inside and outside ledges of window sills, and for cleaning chalk and pin rails in classrooms.

It pays to get a good quality counter brush. Cheap brushes wear out on the front end very quickly. The bristles become matted and curl until they cannot be used. Some districts make a counter brush available in each classroom for teacher-pupil use. These brushes need not be of as high a quality as do those used by the custodian because they do not receive the amount of use.

Wall Brush

A good quality, horse-hair brush, with a reversible connection which allows the brush to lay flat on either the wall or ceiling, should be one of the tools used by every custodian who does not have a vacuum with the proper wall cleaning attachments. It should be provided with a handle sufficiently long to reach the walls without the use of a ladder.

Radiator Brush

This is a twisted wire brush which has a handle about three feet long and is filled in at the end with horse hair for about 8 inches. The handle is sometimes made of thin wood for reaching into narrow spaces. This brush should be kept dry and frequently combed out with a nail brush.

Brush Comb

Dry mops and wet mops last much longer and do a better job if the strands are not allowed to become snarled up. This can be prevented by combing the mops when necessary before they are put away.

A comb can be made by taking an 8" wide piece of 3/4" plywood and shaping it to have a handle and then driving finishing nails into one side to form the teeth of the comb. The nails should be spaced 3/4" apart and should be 2" or 3" finish nails. After the nails are in place evenly a file can be used to smooth down the heads so that the mops will not be damaged by the sharp edges. Another method for smoothing the heads is to dip them into solder. The solder will round the ends of the nails.

Corn Brooms (Straw Broom)

The old fashioned corn broom still has many uses. It is used for sweeping out-of-the-way places. It is good for sweeping down cobwebs, sweeping in water, or wet areas.

Straw brooms are manufactured in several sizes and of different qualities. The standard sizes of these brooms is determined by the weight per dozen and the number of times the brooms are sewed. Sizes used by custodians are:

Extra Large	32 lbs/doz	6 Sew
Large	30 " "	5 "
Medium	20 " "	5 "
Toy	6 " "	2 "

The toy size is usually used when a dust pan on a handle is being used to clean up places such as lobbies while they are in use.

Dust Pans

The custodian makes so much use of a dust pan that it pays to get a heavy one. It is important that it not be too small. The household type is too light for custodial work; one of approximately $10\frac{1}{2}$" by 16" should be satisfactory if it is made of heavy metal. Districts which supply a dust pan for teacher-pupil use will find the househole size very satisfactory for that use.

Paper Carts

Many schools use paper carts for the collection of waste paper. The frame is made of gas pipe large enough to hold a closely woven canvas sack mouth open. Space is also provided sometime for handling such small cleaning tools as a waste basket, sanitary duster, etc. The cart may be tipped and pulled about on two caster wheels or permitted to remain upright while it is wheeled about on casters inserted in four legs.

There are several companies which manufacture these for sale; the price can become quite considerable for them, however. They can also be fabricated locally in the school shop. Some of the larger schools have used large, wheeled, laundry hampers of the type used in commercial laundries where there is a great volume of trash to be picked up.

Hand Sprayers

Every custodial will need one or more spray guns at his school for the application of insecticides such as fly or roach spray. It is usually more practical to use a large spray gun so that a large area may be sprayed at one time without stopping to refill. A quart size is a good practical size.

The best way to apply mop treatment is with a spray gun when the floor mops are being treated. Since this is a frequent process, a sprayer that is used for nothing else should be kept for this job.

Spray Bottles

One of the most convenient pieces of equipment for custodians is a pint size bottle fitted with a push down sprayer. These spray bottles are available in either plastic or glass; the plastic type is recommended to avoid breakage. Many of the larger chemical manufacturers have these available with graduations on the sides to aid in making a use dilution of cleaner. If one or more of these spray bottles are kept with a mild neutral cleaner solution in them, they will be found very convenient for spot cleaning around the school plant. The spray bottle is also very handy for applying a solution of glass cleaner to windows and doors. Some schools use a germicidal cleaner solution in spray bottles to avoid having to carry so many pieces of equipment when cleaning drinking fountains.

Pump-up Sprayer

A 2 or 3 gallon tank pump-up sprayer can be used advantageously in most schools. Whether it is a shoulder strap model, hand carried, or on small wheels, is a matter of individual preference. Some of the uses for this type sprayer, other than spraying insecticides, are spraying disinfectant-cleaner solutions when cleaning large toilet and shower rooms, applying whitewash to tree trunks and fences, spray painting on rough exterior surfaces, and applying lines on playing fields.

Scrub Brushes

Scrub brushes come in several sizes. The most common sizes are 10", 12", 14", and 16". Scrub brushes are more commonly of a rigid type bristle which are good for scrubbing. When the brush is used for scrubbing sidewalks, terrazzo floors, tile walks, and the like, a long handle will make the job easier. A 2 foot handle is good when using the scrub brush to scrub out trash and garbage cans. Sometimes it will be advisable to use a soft bristled brush.

One special type of brush called a "cove" brush has the bristles cut at a right angle across the bottom instead of in a straight line. This angling of the bristles allows you to scrub right up into the cove where the floor meets the wall and up onto the splash board.

Vacuum Water Pickup

A water pickup is a very valuable attachment for the school vacuum. During scrubbing operations many hours of labor can be saved by picking up water with a vacuum equipped with a water pickup attachment. On some models the filter bag is removed and replaced with a pan that has a float cut-off valve to prevent the water getting into the motor. In others, the filter bag is made of synthetic fibers which will not mildew and utilizes a bypass in the motor head so there is no danger of water getting into the motor. In this latter type, changing of the equipment is unnecessary. One of the surest ways to ruin an expensive vacuum is to leave water in it for any length of time. The tank will become corroded very quickly if the tank is not emptied and rinsed immediately following water pickup operations. The hose, wand, and squeegee attachment should also be rinsed and dried at the same time for the same reason.

Gong Brush

The back and handle of a gong brush are made of hard wood or plastic, thick enough so heavy pressure upon it will not cause it to break. The overall length of the brush should be about 8 inches. The back, that part in which the fibers are set, is approximately 13 x 3 inches, and rounded up at the end. The handle is 5 inches long, and cut down to a suitable length and width. The bristles should be 2 inches long and stiff, and the tufts should be inserted perpendicular to the surface in order to give the base of the brush a rounded shape the same as the back. The shape of the brush makes it easy to clean in rounded corners and curved surfaces. The handle is kept short so it will stand up under the heavy and direct pressure placed on it. This brush should be washed out immediately after use and placed on its back or hung up with the bristles away from the wall.

Hand Scrub Brush

The hand scrub brush consists of a solid wood block, shaped to fit the hand. The brush is approximately $4\frac{1}{2}$" x 12", set with fiber bristles approximately 2" long. Brushes vary in weight but should weigh about $8\frac{1}{2}$ ounces.

As a tool for removing dirt from large areas of floor space, the hand scrub brush is practically useless. Its main uses are to clean corners and spaces under radiators where it is impossible to get at the dirt with an electric floor machine or a regular scrub brush.

Floor Scrubbing Machine

A good floor machine is a must for the custodian in a modern school. In large schools it may be advisable to have more than one floor machine. There are several sizes and styles manufactured. Small sizes are good for close areas like offices of schools. Middle size ones are good for classrooms, and the large size ones are very good for large surfaces like gyms, libraries, and corridors. If a school is to have only one machine, a 16" or 17" size will come nearer to serving all the purposes than will any other size. This middle size will be a bit awkward in the small spaces and will be a bit slow in the gymnasium, but it takes a very long time to do a gymnasium with a small machine and it would be very difficult to do the offices with a large machine.

If a school has two or more gymnasiums that are not too far apart, it may be advisable to get a large 23" or 24" machine to be used on just these large surfaces. In large schools consideration may need to be given to purchasing a 12" or 13" machine for use in small rooms if the school is to have more than one machine.

8

The work to be done will determine which brushes, discs, and pads will need to be selected. Wire brushes are available for coarse work, such as severe scrubbing operations or for the removal of dry, caked dirt. Bassine brushes are very good for ordinary scrubbing, but discs of synthetic material are also being used more and more for this purpose. Tampico brushes are good general polishing and palmetto brushes do a good job of heavy duty polishing. Steel wool pads for floor machines are available in 0, 1, 2, and 3. Some schools may have their custodians cut their pads from rolls of steel wool. Several companies are now producing discs made from a synthetic material. These discs may be used under an old floor brush but a regular attachment for holding them is better. The discs come in various textures suitable for the various jobs to be done. These discs are proving to be very satisfactory because they last very well and they do the job much faster.

A floor machine will give better results if it is kept clean, properly oiled and stored in a dry place. The brushes should be stored in a dry place. They should be hung on the wall with the bristles out. This will help the bristles and the brush to keep their shape. An out of shape brush causes the floor machine to wobble.

Dispensing tanks have been adapted for use on floor machines and a large floor machine has been developed which has a tank containing the scrubbing solution to be applied, the scrubbing brushes, a vacuum water pickup and a tank for the used solution. These large machines make it possible to do a classroom or other large area in just a few minutes. They are usually electric and some are battery powered.

Wet Mops

Mop heads for wet mopping are made from cotton or linen. Linen is the best material but is not often used in schools because it is very expensive.

There are many sizes and weights of mops used and all of these are available from the supply houses. Most custodians use a mop about 8" wide and 36" long. The length is doubled so that the strands are 18" long when placed in the mop holder.

The size of the mop is designated by its dry weight. Some supply houses list this weight for a dozen mops and some list it for a single mop. The small size is 9 pounds per dozen or 12 ounces each. The next size is 12 pounds per dozen or 16 ounces each. This is the smallest size practical for school use. This size is recommended for women custodians when they are working in small areas.

A medium size mop is the 15 pounds per dozen or 20 ounces each. This is the smallest size recommended for men custodians and it is recommended only in small areas. This size is a good size for women. A real middle size mop for schools is the 18 pounds per dozen or 24 ounces each. This is a good size to be used by school custodians in ordinary areas.

The large mop is 24 pounds per dozen or 32 ounces each. This is a good size to use when large areas are to be mopped.

In selecting the mop to be used, it is well to select the largest practical size for the job. Much time will be saved when a large mop can be used. A custodian will want to have more than one mop with his tools and he will want to always wash his mop out after it has been used.

A mop should have a handle of the proper length. It should be long enough to reach from the floor to the forehead of the user. This will permit the user to make a long stroke of 6 feet or more crosswise to his body. A short handle will cause him to stoop and get tired. Short push and pull strokes used in household work will cause the custodian to become tired too fast if he has a large area to mop.

Standard lengths of mop handles as they come from the vender are 54", 60", and 72". Handles should be kept clean and dry. A handle can be cleaned by sanding it lightly.

Mop Wringers

Mop wringers are available in several sizes. Consideration should be given to several points when a selection is being made. The wringer must be large enough to fit the size mop that is to be used. Second, the wringer must be a size that fits the bucket. A large wringer will not fit a small bucket. The sizes of wringers that are used in schools are:

# 2 -- small
# 1 -- small
# 0 -- medium
# 00 -- large

A wringer that presses from the sides is the best kind because it will not squirt water all over the floor as it is used.

Each time a wringer is used, the bits of string and pieces of mop head should be removed as the wringer is cleaned. These will harden and become difficult to remove if left on too long. One drop of oil on moving parts occasionally will prolong the use of the wringer.

Following are corresponding sizes of mop buckets, mops, and wringers:

Mops	Bucket	Wringer
12 oz.	10 quart	# 2
16 oz.	12 quart	# 2
16 oz.	14 quart	# 1
20 oz.	20 quart	# 0
24 oz.	28 quart	# 00

Mop Buckets

Mop buckets are usually oblong in shape. For school use they should be mounted on casters or a dolly. A custodian can avoid much fatigue by rolling these buckets of water instead of carrying them. There are a number of different sizes of mop buckets and the custodian should select the size that fits his purpose.

Home size mop buckets are 10, 12, and 14 quarts. Medium size buckets are 20 quarts. Large size buckets are 28 or 32 quarts. Giant sizes go up to 50 quarts.

Single mop buckets are satisfactory if you are not rinsing at the same time. Two buckets mounted on one dolly will save much time when the surface is being both washed and rinsed at the same time.

Mop buckets are available with the wringer attached. This type does not prove to be too satisfactory for school use. It is recommended that mop buckets be purchased with the wringers separate or detachable.

Metal mop buckets can become corroded by continuous contact with cleaning solutions. To prevent this the bucket and wringer should be rinsed with clear water each time after it is used.

Hand Scrubbing Pads

Hand scrubbing pads made of a nylon material are becoming increasingly popular for cleaning hard to reach areas and for heavy scrubbing of surfaces which would be damaged by extensive use of abrasive cleaning compounds or steel wool. These pads are used just like a cleaning cloth, may be washed out and dried for re-use. They will not leave a residue to rust as will the steel wool hand pads.

Toothbrush

Many custodians have found that a toothbrush is very helpful in cleaning in hard-to-reach places, such as around the heads of drinking fountains and around faucets of lavatories. The ones used for drinking fountains should be kept separate from others and should be used only for this purpose.

Dusters

The dusters that are most commonly used by custodians are short, twisted strands of cotton attached to a canvas cover. There are three types in use with some variations of each type.

The one most commonly used is made to fit over a wire frame which is attached to a wooden handle about 16" long. It is fastened to the frame and handle by convenient tie strings.

Another type looks very much the same at first glance but is split at the end to form a V. The two sides of the V allows two sides of an object to be dusted at the same time. There are variations of this type that are made just for dusting Venetian blinds.

The third type of duster has a place for the hand just like a mitt or glove. There is no wooden handle. The custodian slips his hand inside and moves his hand about to do the dusting.

All three of these types of dusters should be treated lightly with a dressing. The advantages of all three types lie in their being easily laundered by the custodian. They can all be used to do a good job of dusting in all the places where a dust cloth is not needed.

Dust Cloths

Dust cloths may be roughly divided into two categories: cloths treated lightly with a non-oily mop treatment and plain cloths that are dampened with water. Either type should be of a cotton, lint free, with the edges bound or cut so that they will not fray. The material should be heavy enough to stand repeated laundering.

In the first category, the treated sweeping tool covers mentioned earlier, have also been used as dust cloths. A mechanics cloth which has had any oil laundered out of it may be treated lightly with non-oily dust mop treatment and used for dusting. This type cloth has the advantage of not drying out while in use.

A damp cloth, such as sugar sack liner, makes a good general purpose duster. However, if the dusting job is interrupted, they must be remoistened before the job can be continued.

Toilet Brushes

Toilet brushes come with straight or with curved handles and with tufted or looped ends. Tampico or palmetto bristles are best for school use. The light household toilet brushes are not satisfactory for school use.

A sponge is recommended where daily or more frequent cleaning has been done. When a day or more has been skipped or where a buildup has been allowed to accumulate, a good brush is a better tool.

When using a brush to wash toilets and urinals, care should be exercised at all times to avoid jamming the brush against the porcelain in a way which might scratch or do damage. As soon as the bristles are worn away from the end of the brush, it should be discarded.

Some districts instruct the custodians to use toilet bowl brushes for washing gargage cans. They are fine for this because the length of the handle is correct and because the sides of the brush wear well. It is the end of the brush that wears out quickly.

Toilet Cleaning Kits

Several manufacturers have come out with a toilet cleaning kit for use when an acid type toilet bowl cleaner is used. This kit consists of a holder for the cleaner container, a toilet bowl mop, and a mirror for inspecting the under side of the rim. These kits are handy because they keep all the materials together for this one particular job.

One type has a sprayer with a length of plastic hose attached for spraying the cleaning solution up under the rim of the fixture. Most supply houses carry at least one type of the kit and they are not too expensive.

Force Cup (Plumber's Friend)

The best type of force cup for school use is the large rubber ball with the hole in the bottom. The tool is used for unclogging toilets and sinks. A downward thrust on the handle forces air through the drain and then as the ball resumes its shape a suction is created in the line. If the pressure will not loosen the obstruction, then the suction often will, especially if the process is repeated several times.

Snake, or Plumber's Auger

A snake or plumber's auger is a flexible steel cable with a hook or barb on the end. Usually there is a crank on the other end so that the cable may be turned. This tool is manufactured in different lengths and sizes. Some of the more expensive models are powered with an electric motor.

The tool is used to remove obstructions which are clogging sewer lines. The cable with the barb is extended into the line. The cable is kept revolving so that it will bore through resistance and snag the obstruction with the barb.

Hand Mirror

A hand mirror should be available for inspecting the hidden rims of fixtures. These may be of the small type used by women for applying cosmetics or one that has been developed for the purpose.

Those that have been manufactured for this purpose resemble a dentist's or a mechanic's inspection mirror, being approximately one inch square in area and having a 6 or 8 inch handle set on the mirror at a slight angle.

Sponges, Cellulose

Many custodial jobs are best accomplished by the use of cellulose sponges. These are manufactured in many different sizes. Some school systems purchase large sponges and cut them into smaller ones.

Care should be exercised to wash sponges out clean each night. Dirt and chemicals from the cleaners will cause them to rot very quickly.

Floor Squeegee

The floor squeegee is a large strip of rubber attached to a straight or slightly curved support frome with a handle. It is used to push water. During scrubbing and stripping operations a floor squeegee is a very useful tool. Sometimes they can be used to good advantage on washroom or shower room floors. During or following storms they are good to push water back out of doorways or corridors. They are useful when water has been spilled.

In purchasing a squeegee it is best to select a type where the rubber can be replaced. In the long run, this will reduce costs.

The rubber of the squeegee will be softened if it is used in oil or solvent-like material.

Chamois

A real chamois skin comes from an antelope like animal by the name of Chamois. Substitution of the skins of sheep by suppliers is quite common. The substitutions are not nearly as good as the real chamois but they are much cheaper.

A chamois skin should always be washed in warm (not hot) water and squeezed (not wrung) dry.

In testing, note the following characteristics of good chamois: It is of uniform thickness throughout; has a more velvety nap; and when washed may be held firmly in the hands, whereas sheepskin when squeezed seems to ooze out between the fingers like angleworms.

Trash Cans

There is quite a variety of trash cans used by school districts. There is also considerable range in price for these cans.

Outdoor cans are usually of the galvanized type so that they will be rust resistant. A number of different gauges of metal are used in the manufacture of these cans. The heavier gauges are more sturdy and do not become dented so easily when handled roughly. The heavier gauges are much heavier to lift and they are much more expensive than the lighter ones. It is usually advisable to use the heavier ones for slops and heavier materials. Most trash cans can be purchased with or without lids.

Indoor trash cans come in many sizes. Appearance is often very important for indoor cans. In some locations it adds to the room appearance if colored cans are selected.

Many cans are made of plastic or cloth liners can be inserted on the inside. These liners may be lifted out and the contents emptied without moving the heavy outside can. These liners are usually washable and always replaceable. Lids for inside cans come in several forms. The most common is a swinging lid, but there are some spring lids.

Some manufacturers have recently started marketing trash cans made of plastic material. There are some advantages in using these containers. They are very lightweight and, therefore, very easy to handle. They do not dent like metal containers and they are easy to wash. They are often used in cafeterias or lunch areas where milk and other food becomes mixed with the trash. Used in this way and in these areas, they are real time savers.

The disadvantages of these containers are that they are more expensive than metal; they will melt or get out of shape if they are exposed to direct or contact heat. These reasons have prevented their general use in the schools.

Garbage Cans

Garbage cans should be of the galvanized type since regular metal does not resist the acid and other chemical action of decomposing foods. The size selected will vary with the local needs. They should always have a cover for them that is tight fitting to keep our flies and other insects.

Measuring Cup

A small graduated measuring cup (usually an 8 ounce size is quite adequate) is indispensible to the custodian for properly measuring the mixtures for cleaning solutions. Almost all modern compounds are meant to be used in specific solutions that are the result of careful research by the manufacturer and may become inefficient or even a hindrance to the cleaning effort if improperly mixed.

These cups may be purchased made of a plastic material which greatly reduces breakage.

Door Wedges

A few assorted wooden door wedges may be made locally in the shop to hold open those doors which have a door closer. Many times in the cleaning program this will create a draft to help in drying and odor elimination and often prevents damage to both the door and cleaning equipment as it is moved through the door.

Garden Hose

A custodian needs a 50 foot length of hose to use when he is washing down various parts of the building. A lightweight hose is much easier to carry around than a conventional one. A custodian will also need a suitable nozzle.

An accessory which will help when washing down floors, tables in eating patios, and in any other area where splashing is undesirable, can be made with a 4 foot section of light metal pipe. Fit one end so that it will screw onto the end of the hose like a nozzle and put a 45 degree bend near the other end. This will minimize splashing of the area and wetting the custodian.

Mop Rack

A mop rack for drying wet mops and storing them should be considered a must for the custodian. These can be made locally or can be bought.

PART 2

FIXTURES AND SURFACES

PART 2

FIXTURES AND SURFACES

A. FIXTURES

Commodes

Commodes are available in so many types and sizes that we shall loosely classify them in the following manner:

a. Mounting
    (1) Floor Mounted
    (2) Wall Hung
b. Flush Water Supply
    (1) Tank
    (2) Flushometer (Sloan) Valve

The wall mounted commode has a decided advantage--from a sanitary cleaning standpoint--over the floor mounted ones in that they are much easier to clean around and under. The floor mounted models are difficult to clean around and behind and at times will leak around the base. The height of the seat above the floor is dependent on the fixture itself and the initial installation.

Some commodes are still in use that have a water tank supply, but the majority of those installed in schools are fed directly from the supply line through a flushometer valve, commonly called in many areas a "Sloan valve". Regardless of the type of supply or manner of mounting, all models operate on the same basic principle. All of them have a water seal in the bowl. When the fixture is flushed, water enters the bowl through a series of small holes up under the rim. This extra water starts a syphoning action over the trap, sometimes aided by what is called "jet action", through a small hole near the bottom of the bowl and pointed in the direction of the flush flow over the trap. When the flush water supply stops, the water seal again settles into the bowl. Sometime the trap is in the front of the fixture, sometimes in the rear.

The two basic bowl shapes are round and elongated.

Urinals

Urinals, like commodes, can be either wall mounted or floor (pedestal) mounted. The wall type can be a half-stall, wall hung type or the stall type that is mounted in the wall and floor. Some school plants now have women's models of the pedestal type which are only a modification of the men's type.

The flushing action of the urinal is very similar to commodes. Water enters through holes in the rim (in the case of pedestal types) or through holes at the top (in the case of stall types). Some models have a water seal, as in commodes, while others have just a drain at the bottom.

In some rare instances the trough type urinal is still in use. This type is most unsanitary and difficult to keep odor free and clean.

Lavatories

Lavatories, hand basins (or face basins) are fairly standard; the chief differences being in the type of material used to fabricate the basin. The most common materials used are porcelain on metal and vitreous china. Some stainless steel basins are seen and recently some schools have installed basins and sinks made from fiberglass. A discussion of the different surfaces will follow later in this lesson.

Most lavatories are mounted to the wall by brackets hidden under the rim. A few are pedestal mounted and some are set into a counter. The pedestal mounting again presents a problem when cleaning the floor around the basins.

Different methods of plugging the drain in the bottom of the basin are by use of a rubber plug, drop core or flat drain cover. Of the three methods, the drop core is the most permanent and looks the best but can be the most unsanitary. The drain core is the spot most forgotten when cleaning and sanitizing a lavatory. All drain cores are easily removable for cleaning and should be cleaned weekly.

Soap Dispensers

Since the Florida Sanitary Code forbids the use of bar soap in a public place, the problem of dispensing individual portions of cleaning materials for the hands and face must be overcome with some type of mechanical dispenser. These will range from elaborate multiple heads, central tank units, down to the use of a soda pop bottle by the custodian who has had dispensers torn down or ruined to the point where the stock has been exhausted.

The most common types of liquid dispensers are the globe type, which are the simplest mechanically, and the tank type lather or liquid dispensers. The globe type will have a glass globe atop the dispensing nozzle which has a plunger spring loaded to the closed position. Globes made of plastic are also available as a safety factor against breakage.

Dry hand soap dispensers dispense a form of powder which is either loaded into the dispensers in powder form or in a cake that individually grinds portions each time the dispenser is activated. The merits and demerits of the two types are discussed constantly, but it appears to be a matter of which type the school district prefers.

The metal dispensers are usually chrome plated though some of the powder types are available in enamel paint. The painted models are much less expensive.

Towel Dispensers

Since the common towel is outlawed in Florida schools, there must be a sanitary method of dispensing individual towels. The paper towel is almost universal. These may be of the folded, pack type or the roll type. The cabinets vary in design and shape to suit the individual towel manufacturer. Many of the towel dispensers will dispense the towels from several manufacturers. Some will not, and a specific brand must be used in them. This disadvantage is most noticeable in the roll type dispensers. When mounting the dispensers, make sure they are located near the lavatory yet to one side so that the person drying his hands is not in the way of another person who is washing. The dispensers should also be placed so that the waste paper receptacle can be placed directly underneath it to help minimize floor litter.

The standard dispenser in the past has been enamel on metal, but the trend is toward aluminum or other unpainted alloy metal.

Toilet Tissue Dispensers

Toilet tissue dispensers hold one of the two packs of toilet tissue; the roll pack or the flat, interlocking pack. As in the case of the towel dispensers, the previous models have been painted metal which tend to rust or corrode. The latest models are stainless steel, aluminum, or other alloy. Each of you should familiarize yourself thoroughly with the models found in your school plant so they can be maintained quickly and easily.

Sanitary Napkin Dispensers

These dispensers are usually loaned or leased from the sanitary supply house which supplies the district with the sanitary napkins. Most of them are coin operated by a nickel or a dime. The machine will have two keys; one will open the outside door only so that the supply may be replenished, the second key will open the outside door and also the coin box inside the machine. The importance of keeping a close check on the stock of these machines and not allowing them to remain empty cannot be stressed enough.

Sanitary Napkin Disposal Units

These units are placed underneath the toilet stall partitions in women's and girls' toilet rooms in junior high schools and high schools or mounted on the wall near the vending machine. In elementary schools, they are placed in the women's teachers' lounge.

Some of the models available consist of a metal box enameled in white paint, with a small trap door located near the top operated with a foot pedal or lever. The bottom or one side unlatches for emptying. Others, wall mounted, have a push plate door and a metal box liner to aid in emptying. Some models are available in stainless steel or aluminum.

Wall Mirrors

Most wall mirrors are glass and flush mounted to the wall above the lavatories in toilet rooms. However, many schools are starting to mount them out in the corridor between the entrances of the girls and boys' toilet rooms in an effort to reduce breakage by vandalism. Those with a frame around them seem to be less subject to breakage.

Highly polished steel mirrors are also available for areas where breakage of glass mirrors has been quite high, but the cost of them is quite expensive. In addition, the metal mirror is more subject to scratching and will lose its finish if not properly cared for.

Drinking Fountains

Perhaps no other fixture around the school plant has so many variations in models as the drinking fountain. Most of the older models were wall mounted. With the invention of cooling units, the cabinet model became quite popular. One big disadvantage of these cabinet models is that they create an obstruction that disrupts traffic in corridors and creates a cleaning problem around it. Now the trend is back to wall mounted models, some semi-recessed, some completely recessed, and some not recessed at all.

The materials used in the construction of drinking fountains cover quite a range. It appears that the most popular ones have become stainless steel or vitreous china. Lately the plastic models are gaining favor. Almost all except the oldest ones use chrome plated metal for the head and handle of the fountain.

B. SURFACE FINISHES

In the past the school custodian had relatively few different types of surface finishes for which he was required to remember specific cleaning and sanitizing directions. Today science is developing and producing new materials for the architect to use almost faster than the architect can find uses for them. Some of these materials are so new that we are still developing the best methods for the care and cleaning of them. In this section we will attempt to cover most of the broad classifications of these materials and specific examples in each class that you might encounter with any peculiarities of each which you should know when cleaning and sanitizing them. In all instances where manufacturers' instructions are available to you, it is well worth your time to study them in detail.

Aluminum

Aluminum is derived from the chemical alumina, a kind of earth. One-twelfth of the earth's surface is alumina in various compounds, in case you are interested, which makes it seem plentiful, but many intricate processes are involved in extracting it for use.

New aluminum can be kept bright and shining for a long time by using mild soap or detergent and water. Rinse with warm or hot water and polish with a soft clean cloth. Mild soap or detergent is recommended because strong alkaline cleaners tend to dull the finish. Stubborn dirt can be removed with very fine steel wool, rubbing in one direction only, not in a circle. Rub spun aluminum in the direction of the surface lines. Ordinary abrasive cleaners are too harsh for aluminum. Cleaning compounds containing soda, lye, ammonia and other strong alkalies injure the surface and discolor the metal. Alkalies tend to darken the metal; mild acids brighten it. Strong acids attack aluminum.

Brass

Brass is an alloy of copper and zinc. Usually two parts of copper are used to one part of zinc. To clean brass, use a cleaner made especially for it. It can be washed in a regular cleaning solution without harm. If a commercial cleaner and polish does not remove corrosion spots, try rubbing with salt and hot vinegar or with a lemon rind dipped in salt. After cleaning wash and rinse thoroughly.

Chromium

Chromium is a soft, silver-colored,rust-proof metal discovered in 1797. It is prepared from its oxide and is never found in its metallic state. As a metal, chormium is used as a plating for plumbing fixtures, metal furniture, electrical appliances, etc., and is easily recognizable by its bluish sheen. It is also used in making stainless steel.

Chromium usually needs only to be wiped with a soft, damp cloth and polished with a dry one. If very dirty, it may be washed with a mild soap or detergent. Harsh metal polishes and cleaning powders should never be used on chromium. They are totally unnecessary and wear off the plating. Faucets, waterpipes, etc., that become green with corrosion do so because of pitting of the plating from abuse or where the plating has been broken in some manner. This green corrosion is not on the chromium itself, but the brass undermetal and the problem should be treated as brass corrosion. Afterwards a light oily film will help retard further corrosion. Re-plating is the only way to stop this corrosion completely.

Copper

Copper is a red metal, found in a pure state and in many ores. It gets its name from the Island of Cyprus and was first called cyprium metal or cyprium. Copper is used quite extensively as an electrical conductor and is also very flexible, making it popular for certain plumbing lines which must follow irregular paths or be flexible enough to stand vibration. Copper can be cleaned with ordinary cleaning supplies and if it must be polished, a commercial copper polish is recommended. Note: The green corrosion on copper is toxic.

Monel Metal

Monel metal is an alloy of nickel and copper, named for the French scientist who perfected it. Monel has a dull, silvery sheen and is often used for work surfaces, kitchen utinsels, etc. When it is new it fingerprints easily, but becomes easy to care for through use. Wipe it with a cloth or sponge wrung out of hot soapy water or water with a detergent, rinse and rub dry. If desired, scour it with a scratchless cleaning powder such as whiting. Rinse, dry, and polish with a dry cloth.

Stainless Steel

Stainless steel is an iron alloy containing chromium. It seldom requires more attention than washing in hot suds, rinsing and drying. Stainless steel is rustproof, but salt and acids can cause pit marks if left in contact too long. If spots do appear, clean with fine stainless steel wool and whiting. Polish with a soft cloth. The use of abrasive cleaning powder will scratch the surface and dull it very quickly.

Galvanized

Galvanized metal is iron or steel with a thin coating of zinc. Regular washing with hot soapy water will keep a galvanized surface clean. If required, a mild scouring powder can be used. Tarnished galvanized metal can be brightened by rubbing with vinegar or lemon juice diluted with a little water. Let the acid remain on the surface for a few minutes, then rinse with clear water and polish with a dry cloth.

Glass

Glass is made by fusing silica with alkalies, metal oxides, and salts. It can be cleaned with many different substances with the exception of a few. Glass is very easy to maintain. Do not use an abrasive cleaner on glass as it will scratch the surface. This includes steel wool. The film left by dirty cleaning water or some soaps is very notoceable and should be rinsed well after cleaning and polished with a soft cloth.

Glazed Ceramic Tile

As the name implies, glazed ceramic tile has a glass-like finish and should be treated as such. Abrasives will ruin the finish as it will glass and strong acid cleaners can also damage it.

Unglazed Ceramic Tile

Unglazed ceramic tile is manufactured in the same manner as glazed ceramic tile except that the second glaze firing is eliminated. It can be cleaned with most cleaners, including scouring powders, but acid will harm it.

Vitreous China

Most commodes and urinals and some drinking fountains and lavatories are made of vitreous china. Vitreous china is made by firing china clay in a kiln to a very high temperature to harden it. It is again fired after being coated with a glazing compound to give it its glass-like glaze. Vitreous china is impervious to almost all cleaners, but the surface can be broken, like glass, by a heavy blow or excessive use of an abrasive. Once the surface has been scratched with an abrasive, it cannot be restored unless it is re-glazed and re-fired. Acids can be used to clean vitreous china.

Porcelain Enamel

The term "porcelain enamel is used to describe enamelware fused onto steel or iron at high temperature. Most service sinks and lavatories fall in this category. The basis of this enamel is usually limestone, making the use of an acid cleaner on the surface highly dangerous to the surface. Prolonged abuse of the surface with abrasive cleaners will remove the glass-like surface finish resulting in a dull, scratched surface which picks up and holds dirt and stains and requires very frequent cleaning.

Plastics

"Plastics" is a family name like "cloth" or "metal". Just as there are many kinds of cloth and metal, there are many kinds of plastics, each with its individual characteristics and qualifications for certain jobs. Plastics are synthetic, or manmade, materials which scientists have developed to take the place of more expensive and less durable materials. There are actually eleven main branches of the plastics family which fall into two main groups. "Thermoplastic" plastics are those which soften when exposed to sufficient heat and harden when cooled. The pliable plastic seat coverings like nauga hyde R would fall into this category. "Thermosetting plastics" are plastics which are set permanently by heat into various shapes during forming. Heat applied later will not soften them. Formica, Micarta and some of the plastic sheets and panes fall into this category.

Each of the eleven branches of the plastics family, except nylon, is represented in advertising by various trade names, a circumstance which makes the whole matter very confusing. However, all plastics can be cleaned safely with warm water and neutral soap or detergent and a soft cloth or sponge. This is preferred to wiping them with a dry or even a damp cloth as there is a tendency for dust particles to scratch the surface of fine plastics unless they are lubricated. Soap and water provide that lubrication. Abrasive cleaners are ruinous to plastic surfaces. Some plastics are acid resistant, but the use of acids on them should be avoided until you have checked with the manufacturer of the specific product about the advisability of such drastic methods.

Terrazzo

Terrazzo is a mixture of about 70% Portland cement and 30% marble chips. The surface is ground smooth and then polished and sealed. Dusting and then damp mopping with an occasional thorough cleaning with a neutral cleaner is all that is needed for normal maintenance. For heavier cleaning, a scouring powder and a floor scrubbing machine may be used. Thorough rinsing and buffing following this is necessary to restore luster. The National Terrazzo Manufacturers' Association stresses the fact that a neutral cleaner must be used in cleaning a terrazzo floor. Acids and alkalies will attack the marble and acids will attack the cement binder, loosening the chips and causing pitting. The marble will also absorb alkaline salts, expanding and causing a dusting.

Concrete Floors

Untreated concrete floors are difficult to keep clean and sanitary. This is especially true if they are in toilet rooms where uric acid and salts attack the floor and create an unsanitary condition. Cement floors should be sealed or painted in an effort to give them an impervious surface.

Quarry Tile

Quarry or promenade tile is semi-vitreous and is much used in shades of red in vestibules, kitchens, patios and toilet rooms. This tile is very easy to maintain and should not be waxed. Quarry tile is very slippery when wet. It can be cleaned and scrubbed with strong cleaners and abrasives without harming it. However, strong alkalies will harm grouting.

Resilient Flooring

All the "soft tile" floors, such as linoleum, asphalt tile, vinyl asbestos, and vinyl should not be abused with strong alkaline or acid cleaners. A good neutral cleaner will do the cleaning job quite well and a properly used disinfectant in the cleaning solution or rinse water will not harm them. A more thorough treatment of floors will be covered in a later course.

Rubber

Rubber products are attacked by oil and other petroleum products. Strong alkalies tend to "dry out" rubber and make it brittle and age prematurely. Rubber should be rinsed thoroughly after coming into contact with strong cleaners. Acid attacks rubber very quickly.

Unfinished Wood

Unfinished wood is very difficult to maintain and keep sanitary because it is like a sponge. It should be washed with a neutral cleaner and water, making sure you don't flood or allow the water to stay on long or it will be absorbed into the wood and raise the grain. Unfinished wood can be bleached using a weak solution of a hypochlorite mopped on lightly and allowed to dry without rinsing.

Finished Wood

Varnished wood should be treated as a lacquered surface. Neutral cleaner and water will remove normal dirt. Heavy scrubbing will remove the finish, especially if an abrasive powder is used. If normal cleaning will not suffice, the surface probably will need sanding and refinishing.

Painted Surfaces

Surfaces that have been painted with an enamel or other oil based paints may usually be cleaned with a neutral cleaner in warm water with little worry. If a water based paint has been used, it is advisable to check with the maintenance department for the specific instructions for cleaning that particular paint, restricting your cleaning to dusting until detailed instructions are available.

Recently, a new type of wall covering known as cold glazed wall covering has become popular which has a surface resembling glazed tile and which the manufacturers state is impervious to almost any type of cleaning compound. If you have some of these finishes, they should be treated as you would a regular glazed surface. Some of the trade names for this surface are "Cement Enamel" and "Glazcrete".

Marble

Marble is a form of limestone, more or less crystalline or granular in structure. It is found in many colors and combinations of colors. Synthetic detergents are better for cleaning marble than soap because they do not leave a film or scum on the stone and the water does not have to be softened. If the marble is a floor type, that is with a soft, satin (honed) finish rather than a high polish, a cleansing powder may be used on it providing it is rinsed thoroughly. Do not use harsh cleaning powder or acids. Oxalic acid is sometimes used to bleach white marble but must be used with precautions.

Granite

Granite is very hard, strong, and durable and takes a high polish. For these reasons, together with its variety of textures and colors, it has a very important place among building stones. It is used particularly for basements, base course, columns, thresholds and steps although there are many examples of its use for entire facades.

Considering the foregoing properties of granite, a wide range of cleaning materials may be used on it, with the exception of acids.

Soapstone

Soapstone is the name given the very dense stone used on laboratory counters and in the construction of exhaust hoods in the laboratories. Soapstone is used for this because it is virtually impervious to all chemicals so it can be cleaned with no worry. Soapstone cannot take rough treatment, however, because it is brittle; a sharp blow will crack it easily and it can be gouged readily by a sharp object.

Limestone (Coquina)

Coquina consists of an aggregate of shells loosely cemented together. It is found near St. Augustine, Florida, and though used there as a building stone, it is too fragile and too easily affected by frost to be practical elsewhere.

Upkeep of coquina is relatively simple. An occasional dusting with a soft brush or vacuum will keep its rough surface fairly clean. If a more thorough cleaning is needed, it may be washed and bleached out using a weak solution of a sodium hypochlorite, such as Clorox.

Precast Slabs (Aggregate)

Precast aggregate slabs are used for decorative vertical surfaces in some entranceways and lobbies. These are chips of stone or pebbles set into concrete and giving a pleasing texture. It should be dusted frequently with a vacuum or soft brush and washed with a neutral cleaner and rinsed when necessary. Do not use any acids on it or harsh alkalies.

Cement Block

The rough surface of cement block is difficult to clean if it has not been sealed or painted in some manner. Dusting is about the limit of the cleaning that can be done. If washing is attempted, the dirt and water will usually be absorbed into the block. Vacuuming or brushing with a soft brush is recommended.

Carpets

Other than daily maintenance,which will be covered in the course on floor treatment, the care of carpets should be left to a person who has been trained in carpet treatment.

Asbestos

Asbestos might be encountered in the form of insulation around pipes or in some cases sheets used for heat insulation. This should be dusted only, as it tends to absorb water and any attempt to wash it will streak the surface unless it has been painted.

CHAPTER 4

CLEANING AND SANITIZING METHODS

CLEANING METHODS

Now that we have considered the different tools, fixtures, and fixture surfaces, the best method of employing the tools furnished us is naturally the next step. Regardless of the supplies we have on hand, if they are not utilized to the best advantage the results will either be a poor job or more time and energy will be expended than is necessary. With greater demands for the custodian's time, he must strive to "streamline" his work at every opportunity or face the possibility of never completing it. The methods discussed in this chapter are aimed toward this end of "streamlining" the custodian's work without sacrificing quality.

While the succeeding procedures may seen new to some, they are not to be construed as the ultimate by any means. These procedures come from many sources. They have all been tried and are in use in many Florida schools. Modification of some of them will be necessary to fit the exact conditions of a particular school; you will find that they are not so "iron-clad" that they cannot be adjusted to fit most situations.

This chapter on Methods will be broken into several sections for ease of study. Procedures discussed in early sections will not be repeated in later sections, but only referred to.

A. TOILET ROOMS

The general efficiency of a custodial staff in a school may usually be judged by the condition of the toilet rooms in that school. Cleaning of toilet rooms should be rated as one of the most important jobs of the custodial staff.

It is important to properly clean toilet rooms for a number of reasons:

(1) They have to be clean to meet proper standards of sanitation;

(2) Clean toilet rooms are a sign of decency and respectability and encourage high standards of cleanliness elsewhere;

(3) Dirty toilet rooms tend to build ill will for the school and custodial staff;

(4) Dirty toilet rooms tend to be disagreeably smelly and may be the source of odors in nearby corridors;

(5) Dirty toilet rooms tend to encourage messiness, mischief and vandalism on the part of students.

The cleaning of toilet rooms need not be a disagreeable job. However, improperly maintained toilet rooms, those which have been allowed to become excessively dirty and smelly, are troublesome. The cleaning of toilet rooms and fixtures should be a daily task of every school day. In fact, some rooms which have a lot of traffic may need attention two or three times a day. It is well to check the condition of the toilet rooms after recess periods and after the lunch hour to see if the floors need sweeping or damp mopping, whether towel cabinets need replenishing, or if some of the fixtures need extra cleaning. One thing is certain, school toilet rooms cannot be cleaned properly by doing a thorough job only once a week. It must be done at least daily.

One of the main problems in connection with toilet rooms is bad odors. This problem can be attacked in two ways. One is to provide proper ventilation to remove the polluted air and the other is to remove the source of odors (bacterial in origin) as far as possible. Deodorant blocks should not be used as they merely cover up odors and very often the original odor comes back. In fact, as has been stated earlier, the Florida Sanitary Code prohibits the use of deodorants in Florida schools.

1. Toilet Room Fixtures

a. Commodes:

The commode must be cleaned both inside and out. The cleaning operation should follow the same pattern for each one so that all surfaces are cleaned in every case. Each commode should have the same parts cleaned in the same order, using the proper tools and materials for the particular part. The method of cleaning both the floor mounted and the wall mounted models is identical.

Some particular points to check when cleaning are:

Seat and Cover

The seat and cover may become cracked, chipped or pitted. Rough treatment is responsible, but lack of proper maintenance is a big reason for the rough treatment. A clean toilet receive better care from patrons. Cracks and pits in toilet seats provide excellent breeding places for bacteria. Such seats should be replaced with new ones. All seats and covers should be washed daily with a disinfectant cleaner. Rinse with clear water and let dry. A commercial rubbing compound has been successfully used to remove mineral deposits from the under edge of seats without harming the seat itself.

The Toilet Rim

Striking of bucket and pails against the rim while emptying can scratch and break the glasslike finish, allowing an entryway for bacteria into the porous, rockline inner porcelain. Also, the nail or screw from a seat bumper which needs replacing will break through the glazing. Replace them as soon as found.

Metal Parts and Rubber Bumpers

Dirty hinges, flush handles, pipes, screws and bolts, take away from the beauty of an otherwise clean fixture. Between the hinges, around the dirty floor bolts, etc., are excellent breeding places for germs. Dirt and dust collect on these metal parts and discoloration and odor quickly follow. Patience is required to bring back the shine and sparkle of dirty metal parts. Once cleaned and shiny, they are easily maintained by daily washing and an occasional coating with a light, clear oil or grease like petroleum jelly.

Toilet Bowl (Inside and Out)

Toilet bowls frequently become stained and waterlined. In many parts of the country mineral hardness in the water is responsible for this. But everywhere the condition can be kept to a minimum through daily cleaning.

A carefully used acid-based bowl cleaner will help remove the stains already present. Daily cleaning with a disinfectant-cleaner will minimize further staining.

All of the outside of the bowl must be cleaned daily -- front, side and rear. Hit or miss cleaning techniques always miss the back of the outside of the bowl. This hidden rear area, an important source of odors, must be specifically included in your cleaning plan or it will offset the good of your effort.

Flush Tank

The flush tank is often the cause for stains and odors which occur in the toilet bowl. Very often, the only time the flush tank is examined is when some plumbing breakdown occurs. For a clean, sanitary toilet, however, it is necessary that the tank be checked regularly.

When the tank shows a need for cleaning, shut off the water, flush the toilet to dump the tank, and wash the inside of the tank thoroughly with a disinfectant-cleaner solution. To rinse, turn the water supply back on and flush the tank after it refills.

Passage and Trap

Uncleaned passages and traps can be the start of plumbing troubles.

Encrustations and filth collecting in the passage are the worst sources of odors.

Harsh acting cleaners are sometimes necessary to remove encrustations, but once removed, the passage and trap are easily maintained by daily cleaning with a cloth, sponge or toilet mop.

Floor Around the Toilet

The final step in all toilet cleaning operations should be the cleaning and drying of the floor around the base of the toilet. Damage to the floor, the hazard of users slipping, odor development, germ growth, are some of the results to be expected if the floor area is not kept clean and dry. Porous floors (wood, cement) should be sealed. Be sure that there is a proper seal between the floor and the base of the toilet.

The tools and materials you would use for cleaning toilets are:

1. One pail or bucket
2. One sponge or cloth
3. A sanitizing solution (disinfectant-detergent and water)
4. An inspection mirror
5. One toilet mop
6. Plumber's Friend or auger

Procedure for Cleaning Commodes

1. Flush all toilets -

When flushing, check for possible stoppages or other troubles. If any are found, use Plumber's Friend or auger. If this will not remove the stoppage, place an "Out of Order" sign on the fixture and notify the Maintenance Department.

2. Wash the water supply equipment -

If it is a tank model, wash the outside of the tank. If it is a flush valve model, wash the valve, handle and piping.

3. Wash the seat -

Both top and bottom. Do not forget hinges and bumpers.

4. Clean the inside of the bowl -

First, lower the water line by pumping the water over the trap with a toilet mop, cloth or sponge; the stains at and below the water line are then visible. CAUTION: Do not pump all the water out of the trap. Leave some in the bottom to prevent sewer gas from coming into the building from the pipes.

Wash the inside of the bowl thoroughly with the disinfectant-cleaner giving particular attention to three trouble spots -- under the rim, at the water line, and the trap.

Toilet bowls that are hand cleaned daily seldom need more than this cleaning. It is through neglect and/or brush cleaning that stains and water-line accumulations build up.

After cleaning the bowl, flush the fixture to provide a clean source of rinse water.

5. Clean the outside of the bowl -

Using your sponge or cloth and cleaning solution, wash all of the exterior including the base and back.

While here, wash the lower wall under the flush valve or tank and the floor behind the base where a mop cannot reach.

6. Inspect the inside of the bowl with a mirror to see if bowl cleaner is needed. If mineral deposits, urine salt deposits, or rust stains are present within the bowl, an acid based bowl cleaner is needed to remove them.

Lower the water line in the bowl by pumping most of, but not all of the water over the trap. Press the mop against the inside of the bowl to remove excess water and saturate the mop head with bowl cleaner until it just starts to drip. Usually 1 to 2 ounces is all that is needed. Rub the saturated mop head on the stains like an eraser. Daily use of a bowl cleaner is not necessary. Once the stuborn spots are removed, proper daily washing will make use of bowl cleaner an infrequent job. Keep checking the spots with a hand mirror as you work to tell when you have completely removed the stain.

After cleaning, flush the toilet to rinse away the bowl cleaner.

CAUTION: When using an acid based bowl cleaner, exercise extreme care sinc it is harmful to floors and certain fixture surfaces. The acid container should be placed so that it cannot be accidentally kicked or knocked over onto the floor.

b. Urinals:

One of the chief causes of toilet room odors is urine. All surfaces on and around the urinal must be cleaned and sanitized each school day in order to control odors arising from this fixture.

The same materials, tools and procedures are used for cleaning urinals that are used for cleaning commodes.

It is a good practice to flush out drain pipes and traps with a water hose at least once a week.

c. Lavatories

Lavatories (also called wash bowls, face basins, etc.) should be cleaned daily or oftener if necessary. Care should be taken to use cleaners that will not scratch or mar the surface of the fixture or its hardware.

Tools and Materials to be Used:

1. One pail or bucket
2. A disinfectant-cleaner solution
3. One cleaning cloth or sponge
4. A clean, dry polishing cloth

Procedure for Cleaning Lavatories:

1. Moisten cleaning sponge or cloth in disinfectant-cleaner solution and wash inside and outside of lavatory including hardware.

2. Rinse washing sponge or cloth under a faucet and rinse the surfaces previously cleaned.

3. Dry and polish the clean surfaces with a clean dry polishing cloth.

Note: A very mild, fine abrasive cleaner may be used as a follow-up to remove rust or stubborn stains. DO NOT use the abrasive cleaner as the primary cleaning agent; to do so will abrade the fine, glass finish from the porcelain surfaces rapidly and will remove the chrome from the hardware, allowing the underlying brass to corrode and turn green.

Do not forget to remove and clean the drain core occasionally if your lavatories are so equipped -- these can become one of the most unsanitary part of otherwise clean lavatories.

d. Towel Dispensers:

Since towel dispensers require so little cleaning, they are frequently overlooked when the toilet room is cleaned. Wipe the fingermarks left from wet hands from them when cleaning daily.

One of the worst "sins of omission" in toilet room maintenance is not keeping a supply of hand towels available at all times. In many cases the patrons are discouraged from washing their hands completely if no towels are available. At best, they will use their handkerchief or toilet paper for drying their hands and face.

e. Soap Dispensers:

It is a point of debate as to which is more discouraging and repulsive: a filthy, gummed up hand soap dispenser, or one that is missing completely. This fixture is one of the simplest pieces of machinery found around the school plant and usually the one which is least maintained. Daily care and servicing with periodic preventive maintenance can eliminate many of the headaches associated with hand soap dispensers.

When cleaning lavatories, wash and rinse the exterior of the soap dispenser. Wipe dry and polish with a clean, dry cloth. At least once a year (most custodians make it a summer job) take the dispenser from the wall and boil out the accumulation of dried soap which mars its appearance and interrupts its operation.

If the dispenser is filled daily, there is little chance for a dry soap scum to build up on the inside surfaces.

Several spare dispensers should be kept available as replacements for any that become damaged or will not work. Prompt replacement of any dispenser when it stops working will discourage vandalism from irritated patrons.

f. Toilet Tissue Dispensers:

All toilet tissue dispensers should be filled daily or as often as circumstances require. The dispensers must be in good working order. Those units which need repair should be removed from the wall, replaced with a spare unit, and then repaired.

If the dispenser is the pack type, you can refill before it is empty by interlocking the first sheet with the top sheet of the old supply. It is not necessary to remove the old package from the dispenser to do this.

g. Heaters:

Heaters in the toilet room should be kept as free from dust as possible since dust is a favorite breeding place for germs. If the heater has a cover, it should be wiped over daily with a cloth or sponge dampened with the sanitizing solution, along with other fixtures. If the cabinet can be removed, the inner portions should be cleaned with a vacuum or radiator brush periodically.

h. Sanitary Napkin Dispensers:

The only maintenance needed for these dispensers is a check to see that there is an adequate supply. If the dispenser becomes inoperable, then the maintenance department should be notified promptly.

i. Sanitary Napkin Disposal Units:

This fixture is a must for the girls and women's toilet rooms when the custodian wishes to avoid the problems arising from plugged up sewer lines.

If the units are the individual ones which rest on the floor under the partitions, they should be emptied then dipped into a separate pail of disinfectant-cleaner solution each day.

j. Mirrors:

Mirrors in the toilet room should be kept clean by wiping them down with a cloth or sponge dampened in the disinfectant-cleaner solution, damp rinsed, and then polished dry using a paper towel or chamois skin. Never use an abrasive cleaner or a dirty cloth on a mirror; these will scratch the surface. Avoid excessive use of water when washing or rinsing. There is the possibility of water getting into the frame and backing, damaging the silvering.

k. Furniture:

The furniture found in the lounge section of the teachers' restrooms and in some student toilet rooms should be wiped down frequently with a cloth dampened in a disinfectant-cleaner solution. Particular care should be taken on the arms and backs at the top where oil from the hands and hair has a chance to accumulate and hold dust creating a breeding place for germs.

Extra care should be given to removal of food crumbs and spilled coffee and soft drink stains in these favorite snack areas.

2. Floors and Drains

a. Floors:

Dirty floors in toilet rooms can be the source of lingering "toilet odor". Such odor is caused by urine spattered concrete, wood, or other type floor and also the wainscotting and partitions. Urine is an acid which will penetrate even the closest grained material. Wood and concrete are especially susceptible to penetration by urine. The chemical reaction of urine in the wood or concrete and the decomposition of the urine itself will cause the lingering odor in the room. This odor can then only be removed by removing the floor or partition and replacing it with a new floor or partition.

New floors in toilet rooms should be sealed before the room is put into use with a penetrating seal especially recommended for the particular type of floor. The floor should be cleaned thoroughly daily and re-sealed at regular intervals. Once urine has penetrated the floor, sealing will do no good.

When abrasive cleaning is necessary on ceramic tile floors, steel wool is not recommended because the ceramic tile is tougher than the steel wool and will abrade it. Also, small chips of steel wool may remain and cause rust stains in the grout. Either a brush or a nylon abradant pad is ideal for this type scrubbing.

Daily mopping of the toilet room floor is necessary and where traffic is very heavy, mopping twice daily may be necessary. Use a sanitizing solution for this mopping.

When the grouting around the floor and lower wall tile becomes dark, it can usually be whitened by mopping with a solution of bleach and water which is left to dry without rinsing. However, this procedure should not replace a thorough daily cleaning, only supplement it.

b. Floor Drains:

Floor drains, unless kept open and clean, can become a source of odors in toilet rooms, showers, and kitchens. Very often these drains become clogged with the build-up of residue from the usually very dirty drainage they carry off. Frequent cleaning of the drain and drain cover is necessary to keep facilities sanitary.

Since most of the drain covers are held in place with metal screws, drains are usually by-passed during cleaning operations. The custodian should have a screw driver among his working equipment so this situation can be avoided. These drains have a trap in the bottom of them which should be treated in the same manner as those under basins and sinks.

When urinals are pressure flushed with a water hose, it is a good idea to pressure flush the floor drain at the same time.

3. Walls and Partitions

a. Lower Walls:

Writing on toilet room walls is an old American custom, though not a very desirable one. Writing and other marks should be removed as soon as noticed. If not, more are sure to be added and the problem reaches greater proportions.

All lower walls in the toilet rooms should be wiped down daily with the disinfectant-cleaner solution. Occasionally, an abrasive cleaner will be needed to remove stubborn stains. Caution should be exercised to avoid marring the glass finish of glazed tile and removing the surface of other types.

> NOTE: To help remove lipstick stains, work some white petroleum jelly onto the stain as a carrier. Then wash this off like any grease spot.

b. Upper Walls and Ceiling:

Upper walls and ceilings, while difficult to reach, can be dusted at regular intervals using a wall brush or a floor dust mop. During the summer vacation, these surfaces should be washed or repainted.

When washing the walls and ceiling, use a neutral synthetic detergent, then rinsing is eliminated. All you have to do is damp dry.

c. Partitions:

The partitions in the toilet room must be cleaned each day, just as any other fixture. When urinals and toilets are flushed, a fine spray of water usually splashes out and will collect on these partitions. If this is allowed to remain, the lower parts of the partitions, unless they are of stone or plastic, will rust or rot out creating a new source for germs and odors.

4. Odor Control in Toilet Rooms

The toilet rooms must be well ventilated. The foul air must be removed and fresh air brought in. If a sufficient volume of air passes through the toilet room, bad odors do not concentrate sufficiently to become objectionable. Bad odors are of two types:

(1) Temporary odors - the daily "in use" odors

(2) Permanent odors - caused by unclean fixtures, urinal traps, toilet stools and stained floors and partitions.

These odors can be eliminated by proper ventilation, frequent cleaning, inspection and care.

Where natural ventilation is all that is available, one must study the various conditions and set the windows so that, if possible, a cross ventilation draws the odors outside the building rather than into a corridor.

Naturally, where mechanical ventilation is available, the unit should be operating throughout the school day.

During the heating season, keep toilet room temperatures between 60 and 70 degrees, if possible. Lowered temperatures reduce the incidence of odors.

Also, users will not tarry long in the room if the temperature is below that of the rest of the building.

5. Standard Sequence of Cleaning

Much of the custodian's time can be saved and a better guarantee that all items have been checked when a standard sequence of cleaning steps is followed in daily cleaning and sanitizing a toilet room. If a definite routine is established by a custodian, he is less likely to forget an item even though he may be pressed for time.

The following is suggested as a routine which might be followed in cleaning and servicing a typical school toilet room:

1. Collect all necessary equipment and supplies prior to proceeding to the toilet room so that return trips to the supply room are unnecessary.

2. On reaching the toilet room, use a door wedge to prop open the door and put up any notice to patrons that the room is temporarily out of use for cleaning. Wedging open the door gets it out of the way and helps create a draft for drying the floor after mopping.

3. Check and service all dispensers. This includes soap dispensers, toilet tissue, and paper towels. If a girls' toilet room, check sanitary napkin dispenser also.

4. Collect waste towels and other trash from the receptacles and place in trash container brought along. CAUTION: Be careful of broken glass and other sharp articles that might be in waste containers.

5. Remove the trash from the floor. Sweep, removing chewing gum, tar, and similar substances with a putty knife while sweeping. Use a counter brush and dust pan to pick up sweepings.

6. Prepare a pail full of sanitizing solution. Mix according to manufacturer's instructions.

7. Clean all lavatories first. Use a production line method cleaning all, and then rinsing all together. Wipe dry.

8. Clean mirrors and shelves.

9. Wipe down all ledges, sills and lower walls, paying particular attention to the walls around light switches and door knobs.

10. Clean toilets and urinals. Wipe down partitions after cleaning each toilet and before leaving the stall.

11. Pour the left over cleaning solution down the fixtures just cleaned. Don't flush. Let it soak for a while.

12. Prepare second cleaning solution in scrub bucket for the floor.

13. Lay this solution on the floor and allow it time to work.

14. Go back and pick up excess solution from the floor, flushing each fixture as you pass. Do not rinse the floor. Allow disinfectant solution to air dry on the floor.

Pour floor cleaning solution out before proceeding to next toilet room. Do not carry any cleaning solutions from one toilet room to another. Prepare a fresh solution for each room.

6. Standard Cleaning Times

Although it is difficult to state that any one type of operation should take so many minutes or seconds under any and all conditions, some schools and institutions over a period of years have developed some fairly consistent standard times for cleaning operations which are interesting to note. Variations from these times must be made to satisfy local conditions, taking into account the nature of the fixtures, cleaning equipment available, degree of skill of the individual custodians, etc.

One group determined the following figures:

Damp mop	10 minutes per 1,000 square feet
Wet mop and rinse	30 minutes per 1,000 square feet
Washroom cleaning	500 square feet per hour

Another group suggests these standards for individual tasks:

Washroom cleaning:

Each toilet, including partition	180 seconds each
Door (spotting)	60 seconds each
Door washing	150 seconds each
Mirror	30 " "
Shelves	30 " "
Wash basins and soap dispensers	120 " "
Wainscotting	30 seconds per 100 feet
Urinal, complete	120 seconds each
Dispensers and containers	15 seconds each
Drinking fountains	90 seconds each

Again, these times are standards that have been developed for particular institutions and are shown for illustration. Each school plant is an individual problem and should be treated as such.

B. DRINKING FOUNTAINS

Enameled cast iron, vitreous china, stainless steel, and aluminum are the most common upward surfaces of drinking fountains. Slanted protected jets are required by most health authorities. The greatest problem exists in people placing their mouths on the nozzle. Regardless of the type of material in a drinking fountain, people use the fountain in many unsanitary ways too numerous to mention. Drinking fountains give clean, sanitary water if they are kept clean and are used and protected in a sanitary manner. Attention to drinking fountains should be given as needed by the custodian to keep them sanitary and in proper working order. Behavior of users must be supervised. Teachers can be a great help by giving proper instructions.

Tools Needed	Materials Needed
Pail	Warm water
Wash cloth or sponge	Neutral cleaning soap or detergent
Toothbrush	Disinfectant

1. Procedure

1. Put needed amount of warm water in a pail.

2. Add the proper amount of disinfectant-cleaning concentrate to the water.

3. Shut off fountain if running.

4. Dampen sponge or cloth in cleaning solution and thoroughly wash the inside of the fountain.

5. Rinse cloth or sponge in the cleaning solution and wring out past the dripping point.

6. Thoroughly wash the outside of the fountain.

7. Rinse and wring the cloth or sponge as dry as possible and wipe the fountain dry.

8. If the dirt is not [illegible] by this method, you will have to use a fine, mild abrasive cleaner. [illegible] that all abrasive is removed when you finish.

9. Dry the fountain with a clean cloth.

10. Clean and put materials away as these should not be used for any other cleaning except drinking fountains.

Notes:

If drinking fountains are cleaned daily, the use of an abrasive cleaner is seldom if ever necessary.

The above solution quantity will clean at least eight fountains.

Do not use an acid on drinking fountains but carefully scrape with a razor blade if cleaning does not remove scale.

The toothbrush is a good tool to use to clean the hard-to-get- places and around the mouthpiece and handle.

A small, fine grade nylon abradant pad will help remove scale where an abrasive cannot be used.

Never use abrasive on aluminum or the new fiberglass plastics. Use the fine abradant pad instead.

2. Floor Mounted Cabinets

The floors around the floor mounted cabinets need special attention to avoid the buildup of light mud and a very unsanitary condition. This should be cleaned daily by hand to avoid buildups.

The outside of the cabinet should be cleaned daily along with the top. While the top may require cleaning more often than once daily, usually once a day is sufficient for the cabinet.

C. LOCKER ROOMS

1. Lockers

The tops of lockers should be dusted periodically and they should be swept under every day. The faces of the lockers should be washed periodically.

This can be a summer vacation period job. The teacher's aid should be enlisted to aid in keeping the interior of the lockers clean and sanitary.

2. Floors and Drains

Floors of locker rooms require daily cleaning. They should be thoroughly washed twice weekly and in many cases more often with a hot cleaning solution. The drains should be checked often to insure they are clean and clear of any obstructions.

The floors of locker rooms should receive the same daily care as those in toilet rooms.

3. Benches

Benches in the locker room should be washed down each day with a cleaning-disinfecting solution and allowed to air dry. This procedure can be a tops-only one, saving the legs for a weekly cleaning.

4. Matting

Matting in the locker room is usually of two types -- cocoa fiber or rubber strips. Both should be cleaned off daily and the floor beneath them cleaned. These mats should be hosed off and dried each day to prevent dark, damp hiding places for bacteria, then replaced for use after the mat and the floor are dry.

5. Ventilation

While proper cleaning will eliminate the source of many locker room odors, proper ventilation, as in the case of toilet rooms, is essential. Use the same methods of ventilating as in the case of toilet rooms. **Note:** Toilet facilities in locker and shower rooms require the same daily care as those in the toilet rooms.

D. SHOWER ROOMS

Shower and locker rooms, usually regarded as complementary units and generally separated by drying areas with connecting passageways, require care similar to that accorded toilet rooms. Floors of shower and locker rooms require daily care and should be washed at least twice a week with a hot cleaning solution. Shower stalls and partitions and the walls of gang showers may become coated with oily deposits from bodies and with an insoluble soap curd, particularly in areas where the water is hard or where it has not been treated to remove them. The frequency of cleaning these partitions and walls can best be determined by experience.

The custodian may be expected to inspect and clean, if necessary, all shower heads once each week. If one of the modern types, the shower head can be cleaned while in place. But if it is one of the older types, it will have to be removed for a thorough cleaning.

Using a hot cleaning solution of a synthetic detergent is often helpful in removing film from the surfaces in a shower room since the synthetics are rarely affected by water hardness. A solution of this type with a soft scrub brush will usually remove this film.

E. CAFETERIA

Although not all school districts require the custodians to aid in the cleaning of the food handling areas of the school plant, we will cover here all of the areas pertaining to food preparation and handling as they might pertain to a custodian.

1. CAFETERIA EATING AREA

a. Tables

The eating tables in the cafeteria should be washed down each day at the end of the lunch periods with a cleaning-disinfecting solution, rinsed and allowed to air dry. Next to eating utensils these fixtures rate among the highest on the priority list for being kept clean and sanitary. The seats of chairs or benches require the same treatment at the same time the tables are cleaned.

b. Floors and Walls

The floors and walls of cafeterias are subject to staining and spotting both from food spilled and from grease and smoke from the food preparation areas. If the floors are not mopped daily with a cleaning solution, food and grease stains tend to be absorbed into the floor and may permanently stain them. The use of hot water in preparing the cleaning solution will help in the removal of greases. Failure to clean the floor daily not only leaves a place for bacteria to breed but also provides food for pests.

Cafeteria walls and windows should be washed on an "as needed" basis. Local conditions will dictate the frequency. However, if this job is left for too long a time, the accumulation of grease on the wall hastens further dust and grease collection on the walls and windows and makes the job of removal more difficult.

c. Other Equipment

Some other items that the custodian may be required to maintain in the cafeteria are the drinking fountains, tray racks, electric fans, and air conditioning units. Daily or weekly washing with a neutral detergent is recommended as the case may be, adding a disinfectant to the cleaning solution if it does not have one built in.

2. FOOD PREPARATION AREA

a. Kitchen Equipment

The school lunch personnel are usually responsible for the entire food preparation area, but on occasion the custodian is required to give them a hand with some of the heavier cleaning jobs. One of these might be the filters in the range hoods. If they are of the permanent type, these can be removed, soaked in a large sink filled with a strong cleaning solution to dissolve the grease, rinsed in very hot water, and re-installed. In some schools the permanent type filters are run through the dishwashing machine repeatedly until clean.

b. Toilet Facilities

Where clean and proper toilet facilities are provided, the food service personnel are more likely to have a proper attitude toward sanitary practices and conditions in the kitchen. All toilet rooms should have self-closing doors and should be kept clean, well lighted, well ventilated and in good repair. Except for large installations, a single toilet and wash basin for each sex should be satisfactory for kitchen workers if separate and distinct from facilities provided for pupils. Hands cannot be cleaned effectively without the use of hand cleaning compounds and warm water. Unless clean towels or other satisfactory hand drying devices are provided, hands may become recontaminated.

3. WASTE DISPOSAL AREA

a. Trash Cans

Trash cans are differentiated from garbage cans in that they hold only dry waste or trash where the garbage can is for wet materials. Trash cans should be emptied daily. Under no circumstances should waste paper be stored in combustible containers -- use metal containers for this.

b. Garbage Cans

Local schools have different methods of garbage collection. Some schools periodically collect garbage with their own personnel; some schools employ garbage collectors; and in other schools the garbage departments of the local municipality collect the garbage on schedule. It will be necessary to follow the practice or practices of your own community. Some regulations which might be helpful include:

1. Garbage cans should be standard in size.
2. Garbage cans should be stored in a screened garbage room with a supply of both hot and cold water. This room should have a floor drain.
3. Garbage cans that are placed outside should be kept covered and in places that are not clearly visible to passers-by.
4. All garbage cans should be labeled with the name of the school on can and lid.
5. Areas in which the garbage cans are kept should be sprayed with disinfectants during the fly season.
6. Empty cans should be kept in assigned places.

If the garbage cans are extremely dirty, first flush with cold water. Then fill about one-third full with hot water. The sides and bottoms should be scrubbed with an old broom until thoroughly cleaned. The cans should then be emptied, drained, flushed, and returned to proper location.

c. Grease Traps

Every kitchen should have a grease trap either inside or outside very near the unit which it serves if the school uses an on-site waste disposal system. The residue from the sinks fills grease traps with solids which must be removed. The custodian should watch this unit, clean it, and keep it functioning properly. Under no circumstances should a trap be left open. A complete stoppage usually requires additional manpower to eliminate the trouble.

A grease trap, unless properly maintained, may be a hazard instead of a help in the operation of an institutional type sewage disposal system. It is, therefore, important that it be cleaned frequently and the intervals between cleaning should be determined by experience in any given location. A rule of thumb for cleaning is to clean when 75% of the grease retention capacity is reached.

It is necessary to remove not only the top layer of grease from the top of the water level, but also any solids which may have accumulated on the bottom. This may call for the use of long handled ladles and a G. I. can on a dolly to receive the wastes. These wastes should be properly disposed of, preferably through the garbage removal system utilized by the school plant. Care should be taken to keep the water content of removed grease trap contents as low as possible to minimize the weight of containers in which these wastes are placed for removal from the premises.

The capacity of grease interceptors and traps may be gauged as approximately two pounds of grease for each gallon per minute of flow-through of waste water.

d. Empty Milk Containers

Empty milk containers can afford food and harborage for insects if not stored properly while awaiting pickup or burning. They should be stored in covered garbage cans until burned or picked up.

e. Loading Dock

The loading dock in the rear of the food preparation area should be kept free of rubbish at all times. This area should be swept as often as needed during the day and hosed down with a garden hose at the end of the day.

f. Incinerators

Schools have many kinds of incinerators. Most of the incinerators are inadequate for complete burning of debris generally found around the school. Local regulations usually set certain clock hours when burning is permitted. A few regulations are needed to standardize the handling of ashes and other unburnables. Smokestack incinerators must not be used during the heating period as the smoke and vapors from the incinerator reduces the stack draft and, likewise, the boiler efficiency. Wet garbage and trash should not be put into the incinerator. Cans, glass or other unburnables should be separated from the trash that is to be burned.

In lighting the incinerator it should be filled as full of trash as possible and lighted on the top surface. This method will promote a larger fire to thoroughly heat the incinerator which will result in good combustion.

You should push the burning material to the back of the incinerator before additional trash is added to be burned. The addition of new material at the front edge of the fire makes possible quick ignition which promotes the desired smoke-free burning.

The incinerator should be cleaned out daily be agitating the grate or raking the trash and ashes over it until the ashes fall through. A garden rake or incinerator rake is to be used for this purpose. With an incinerator fork all the tin cans, wire, metal and unburnable trash are raked out and stored to be picked up with the tin can collection. With a shovel and incinerator hoe, the ashes are pulled forward under the grate and placed in large ash cans to be stored for regular pickup.

Trash should not be burned in wire containers near any wall or building. Trash should not be burned in wire containers during high winds because the smoke will drift into school buildings or into neighbors' homes. Building codes in large cities often prohibit the outside burning of trash altogether.

g. General Area

The entire service area should be kept free of rubbish and garbage both for reason of sanitation and for appearance and fire safety. If good housekeeping practices are followed in other areas, little extra work is needed to keep this area clean.

F. CLINIC ROOM

Since the school health room or clinic is the place where most students report when they are ill, sanitary cleaning of this room should be most thorough. It is not intended to convey the impression that this room should be kept like a hospital, but that it be cleaned and sanitized thoroughly each day to the best of the custodian's ability. This is no area to cut cleaning corners or to skip.

The use of a disinfectant or sanitizer type cleaner is most definitely recommended for this area.

G. SWEEPING

From the standpoint of cleanliness and sanitation, perhaps no duty of the school custodian is more important than that of sweeping and dusting. Not only is dirt brought into the building on children's feet, but a surprising amount of dust also infiltrates the premises via the atmosphere. This dust may originate from many sources and may contain harmful ingredients. For example, an analysis of dust taken from the window ledges of buildings in large cities revealed that it contained ashes, sand, excreta of animals, plaster, soot, brick dust, clothing fibers, hair, steel and micro-organisms.

Whatever the method of sweeping used, the most sanitary one is the one that creates the least dust. The different tools for sweeping might be listed in their order of effectiveness, both from the work standpoint and also from the standpoint of sanitation, in the following order:

1. Vacuum cleaner
2. Treated dust mop
3. Untreated dust mop
4. Push broom
5. Corn straw broom

It has been noted by one authority that a vacuum cleaner is 57% more efficient for cleaning than a push broom.

1. SWEEPING PROCEDURES

a. Sweeping with a Dust Mop.

Mop sweeping is a modern and sanitary way of sweeping and maintaining school floors. Many schools have discarded the use of floor brushes in favor of treated dust mops. Using a dust mop of the proper size is a faster, more efficient method of cleaning the floor than with a brush. Floor brushes will leave a fine, talc-like film of dust. For classroom sweeping, a mop 18 to 24 inches wide seems to be preferred by most custodians. For larger more unobstructed areas, a mop 36 to 60 inches wide is more efficient. For corridors, the 36 or 48 inch mop is popular.

Dust mops which have been treated with a non-oily type mop dressing clean better than a dry one. The preferred method of treatment is spraying with a wax-base liquid mop treatment. If an oily based treatment is used, there is the danger of over-treating the mop and having the excess rub off on the floors. Most floors will be stained or attacked by this oil. For safety to the floor, always request a non-oily type mop treatment.

The most effective method for using a dust mop is moving in a stright line with the mop head staying on the floor at all times. When sweeping, place one hand on the end of the mop handle (power hand) and the other, palm down, a comfortable distance down the handle (guide hand). Push the mop ahead of you, keeping the head on the floor.

After sweeping has been completed for the day, shake the mop vigorously to get rid of heavy, loose soil and then comb out the strands with a mop comb. If needed, spray lightly with mop treatment before hanging up in the storage area.

When treated dust mops become dirty and lifeless, they should be combed out, washed and retreated. Being dirty does not mean being dark in color, but rather one that is full of dust and mud balls on the ends of the strands. (A mop that has been overtreated with mop treatment will tend to make mud balls when put into use.) The preferred method for washing is in a washing machine, however, if this is not convenient, the map may be hand washed in warm water to which has been added several ounces of detergent. Rinse thoroughly and allow to dry. When the mop has dried, it should be retreated before being put back into use.

To re-treat or "cure" a clean mop head, moisten the ends of the strands by spraying the treatment on with a hand sprayer or by using a fruit jar with holes punched in the lid. Do not saturate the mop. Moisten the mop and then roll it up and store for 10 to 12 hours in a plastic bag rolled so as to be air-tight or in a tightly closed container. Capillary or "wick" action will spread the treatment evenly throughout the mop. If this is done in the evening, the mop head will be ready for use the next morning.

b. Sweeping with a Floor Brush.

Although a dust mop is to be preferred on smooth floors, a floor brush must be used when flooring is unfinished wood or concrete or is otherwise so rough and eneven that a dust mop would snag or have excessive "drag". At times the heavy dirt and litter make the use of a floor brush necessary before using a dust mop on a smooth floor.

The technique for handling the floor brush should be almost identical to that for handling the dust mop. Keep the brush head on the floor as much as possible to avoid raising a dust cloud.

The care and treatment of floor brushes has been described in an earlier section on the description and care of hand tools and equipment.

c. Sweeping Techniques.

(1) Classrooms with Fixed Desks

(See diagram)

Close the classroom windows, adjust the shades or blinds, empty the pencil sharpener into the teacher's wastebasket, and them empty this into the trash container in the hall.

Begin sweeping from the front corner of the room opposite the door. Sweep along the side of the room under the windows and deposit the dirt at the back of the room. Starting at the rear, sweep the dirt from under each desk in the row nearest the windows into the next aisle. Since you are now at the front of the room, sweep the next aisle to the back of the room and deposit the dirt there. Repeat the process on the next row of seats, and so on until you have completed sweeping under all of the students' desks. Bring the final accumulation of dirt across the back of the room, up the side aisle opposite the windows and then out the door. Now clean the front of the room around the teacher's desk. Take all the dirt into the hallway, shake out the brush or dust mop and pick up the dirt from the room with a dust pan and counter brush and put it into the large trash container. Be sure to use a trash container which is dust tight and to clean up around it before moving on to the next room.

(2) Sweeping a Classroom with Movable Desks

(See diagram)

Close the classroom windows, adjust the shades or blinds, empty the pencil sharpener into the teacher's waste basket, and them empty this into the trash container in the hall.

Start sweeping next to a wall and clean the space between it and the first row of seats. As the space next to a seat is cleaned, take the tool handle in one hand and with the other pull the seat into the space just cleaned as the sweeper passes by. This will leave the space on which the seats have been sitting during the day exposed for sweeping. When you have reached the end of the row of seats, deposit the dirt at the back of the room and then sweep back up the new aisle formed where the first row of seats had been sitting. Back at the front of the room, repeat the process for the next aisle and row of seats. Continue until the room has been finished. When this is done, the seats are all in rows and will not have to be straightened. The next day begin on the side of the room opposite to the one started with the preceeding day. This will keep lanes from being work in the floor.

Place the dirt pile in the corridor into the trash container and move on to the next room.

(3) Sweeping Corridors

Two tools are needed for this operation---A floor brush or straw broom for cleaning corners and around unusual shaped projections, such as drinking fountains, radiators, flower urns, etc., and a wide dust mop.

First, clean out the corners and around the unusual shaped projections where the dust mop will not reach. Then start at one end of the hall or wherever you want to pick up the dirt at the finish. Move down the hallway in a steady straight line with the dust mop parallel to the wall and return, overlapping the two strokes a few inches to insure complete coverage. Shake out the mop and move down the hall and return the second time if necessary. If you are using a four foot wide mop, the second trip may be unnecessary. Pick up the dirt with the floor brush or straw broom and a dust pan and place it into a container.

(4) Sweeping Gymnasiums
(See diagram)

Since gymnasiums are large and have little, if any, furniture, they are easily cleaned with a large four or five foot treated dust mop. A daily cleaning is almost a necessity.

With a floor brush or straw broom start at the entrance and sweep the dirt and litter away from the edges of the walls and from beneath equipment. Now with the dust mop start at one end of the gym, pushing the dirt and litter in a straight line the length of the gym, make a turn, and return, overlapping the strokes several inches. Make these strokes parallel to the direction in which the floor strips are laid. Deposit the dirt at the end where you started, shake out the mop and continue making this pattern until the entire floor has been swept. Bring the litter at the end of the gym together into one pile and pick it up with a broom and dust pan, placing it into a dust-tight container.

Some custodians use two dust mops simultaneously for sweeping gymnasiums. They place the end of a handle under each arm, grasp a mop handle in each hand, and walk the floor in this manner, making sure the ends of the heads of the mops overlap slightly to avoid skips.

(5) Sweeping Stairs
(See diagrams)

If it is a narrow stairway, a conventional straw broom is best suited for this purpose. Beginning at the top of the stairs with the sweeper standing at a convenient distance below the top step, an outward thrust of the broom is given in the right hand corner. Then the step is swept from right to left where an outward thrust of the broom drops the accumulation to the step below. The first operation is repeated, sweeping from left to right on the next step and so on down the entire flight of stairs.

A wide stairway can be swept in the same manner, although it may be more convenient to sweep toward the center while the operator is walking up to the top, which will save time and also allow the stairs to be used while being cleaned. When the operator reaches the top of the stairs, half the job will be done. Then the operator sweeps down the remaining half of the stairs to the bottom.

In sweeping a stairway which adjoins a wall, always sweep toward the wall. If there is no wall and both sides of the stairway are open, then it would be best to sweep from both outer sides toward the middle.

H. DUSTING

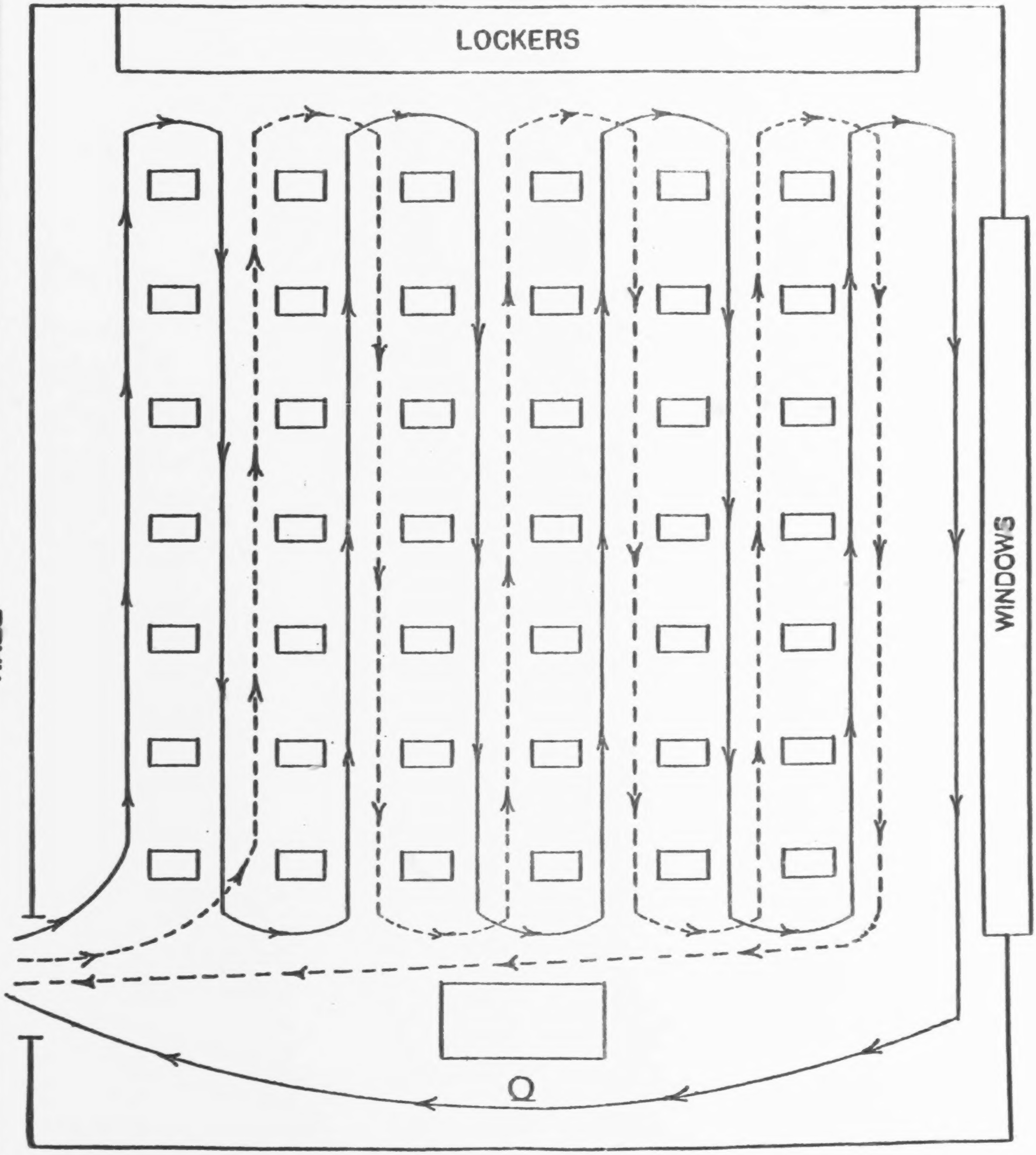
From the standpoint of health, dusting is just as important and necessary as sweeping. Dusting should be done as often and as thoroughly as the size of the cleaning staff permits.

Classrooms should be dusted daily, preferably in the morning before classes begin. Dusting should not be done when students are using the classroom. Dusting at this time of day will remove the normal atmospheric deposits of dust and that which settles from sweeping the previous evening.

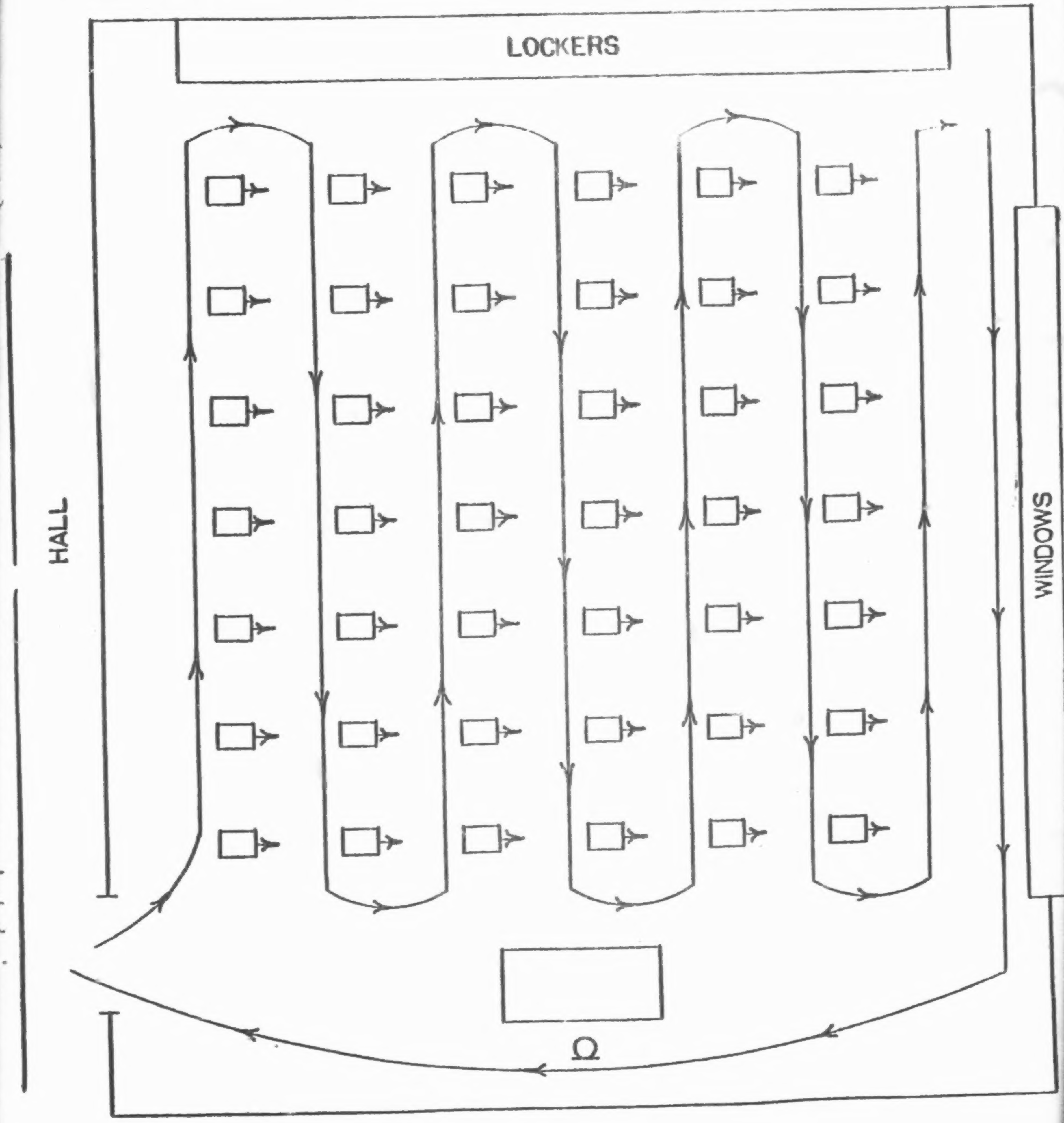
A folded cloth dampened with furniture polish, dust mop treatment, or water makes an excellent dust cloth. A dry cloth or feather duster does not, they merely redistribute the dust. The folded cloth allows refolding to give a clean dusting surface as one side becomes soiled. For a more thorough, periodic dusting job a vacuum cleaner with attachments, a chemically treated dust mop, long handled wall brush or a push or straw broom covered with a clean treated cloth, might be used to reach places beyond are reach.

The diagram on the following page shows one method for dusting a classroom with a minimum of steps and time. Enter the classroom and begin dusting the woodwork on your right and across the front of the room. Continue around the four walls, dusting window ledges, radiators, woodwork, and all objects of decoration such as vases, statues, etc. When the circuit has been completed, step over to the first row of desks and begin dusting their tops, moving to the rear of the room. When the last desk in that row has been dusted, start from the last desk of the next row and dust toward the front of the room. Continue through the room in this manner. Finish by dusting the teacher's desk at the front of the room. This method is knows as the "tops only" method and is an excellent daily procedure. Most custodians can dust a classroom using this method in approximately five minutes.

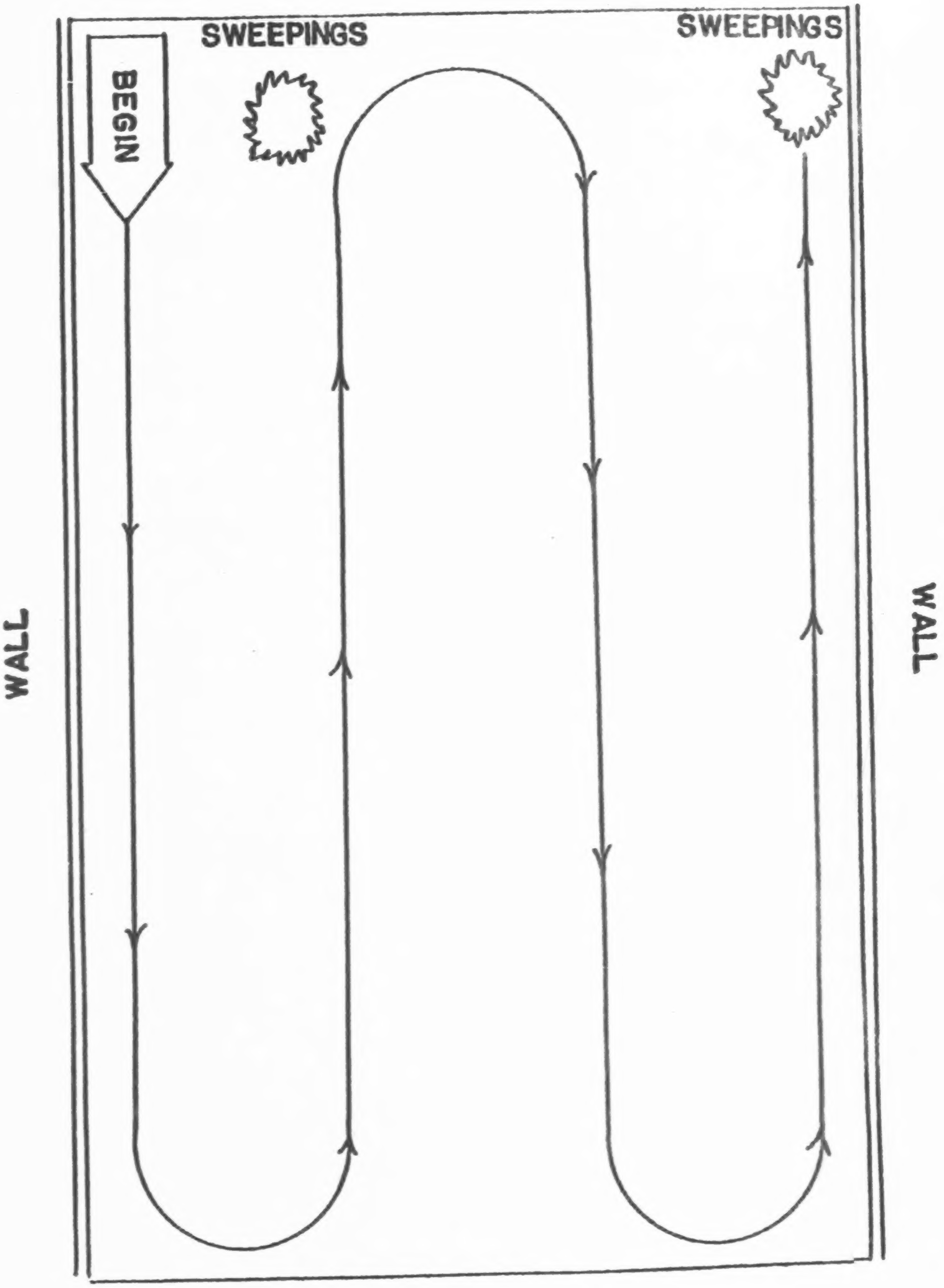
SWEEPING CLASSROOM WITH FIXED DESKS


LOCKERS
HALL
WINDOWS
Ω

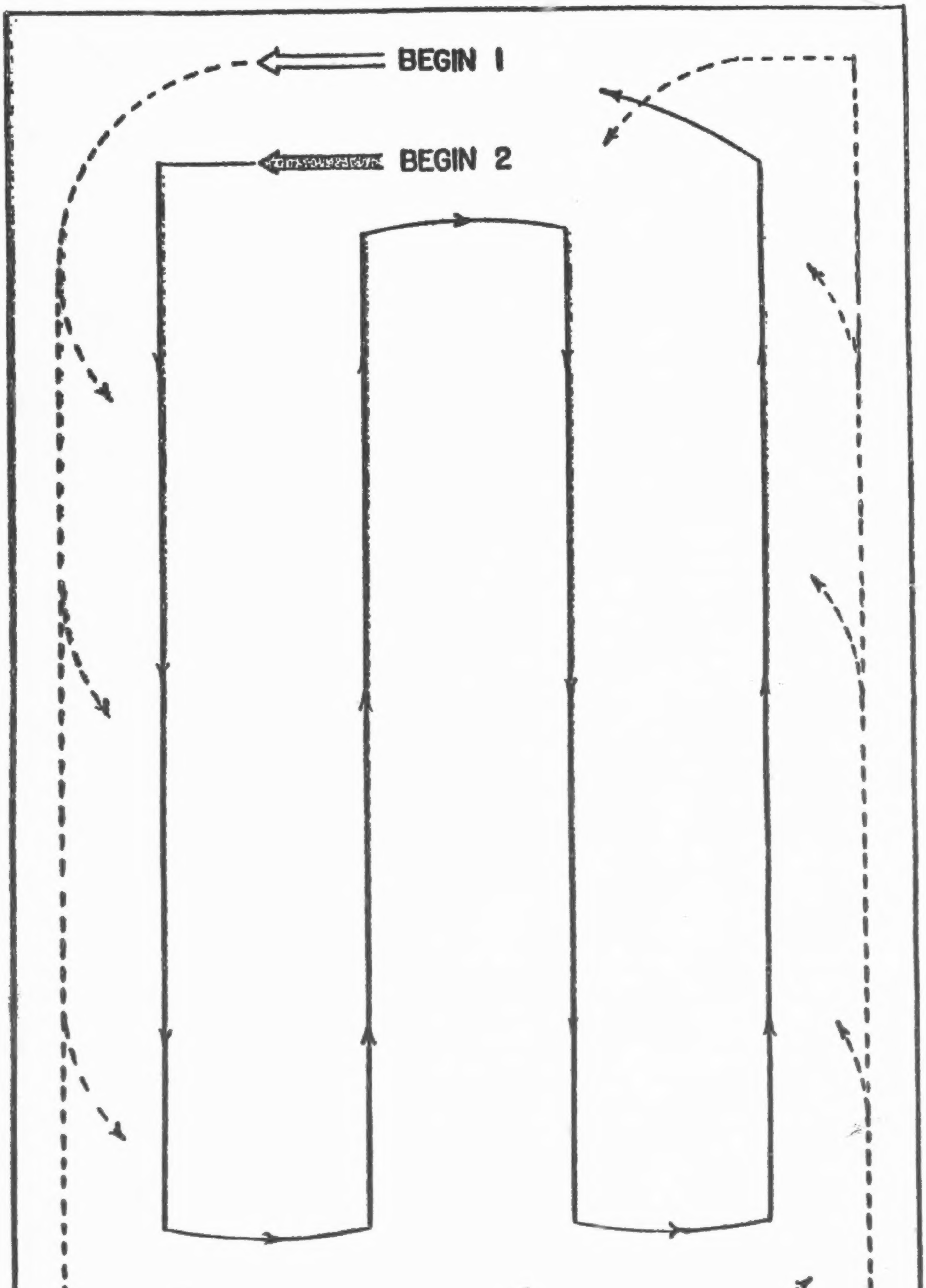
SWEEPING CLASSROOM WITH MOVABLE DESKS


LOCKERS
HALL
WINDOWS
Ω

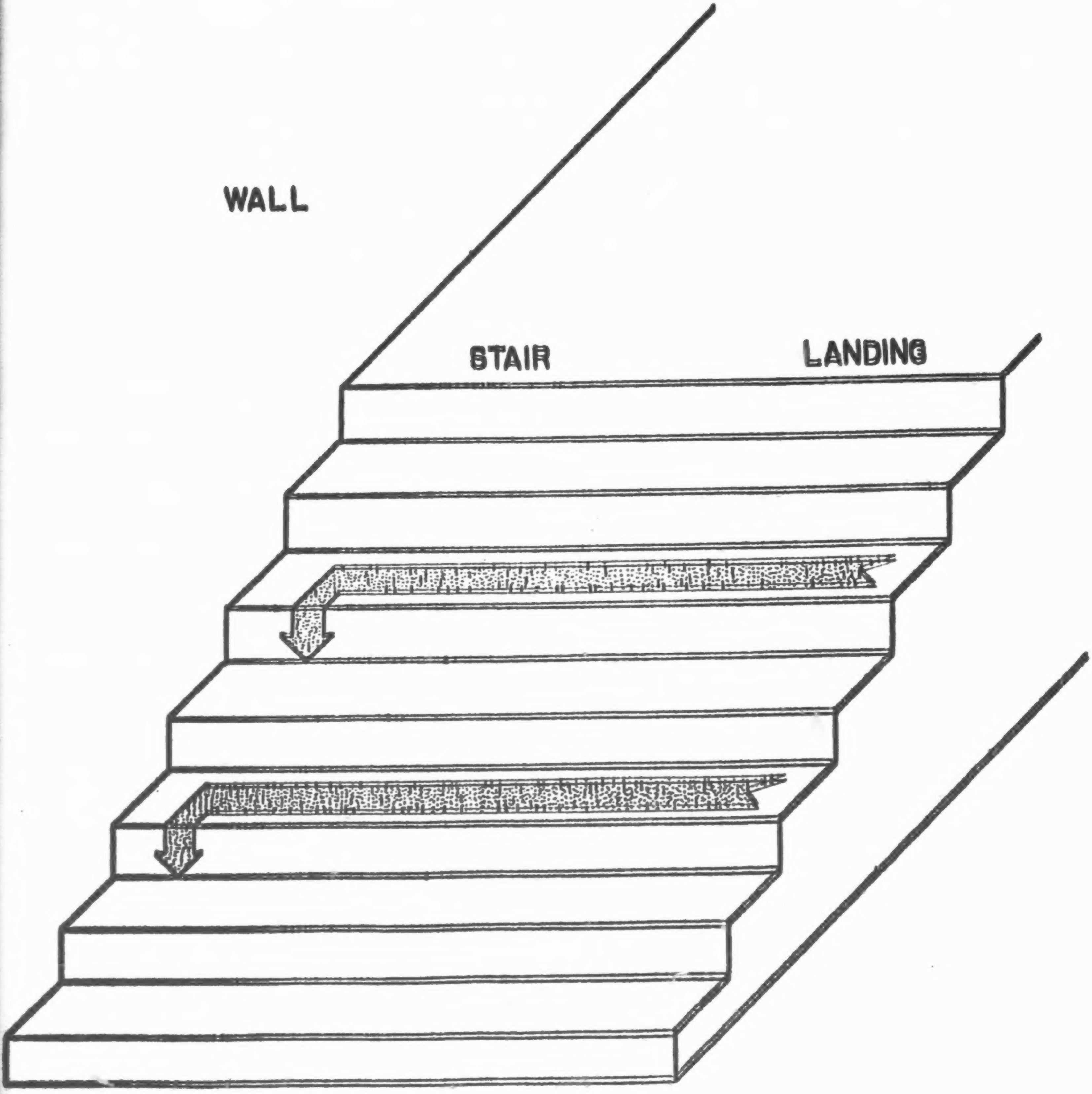
SWEEPING CORRIDOR FLOORS


SWEEPINGS
SWEEPINGS
BEGIN
WALL
WALL

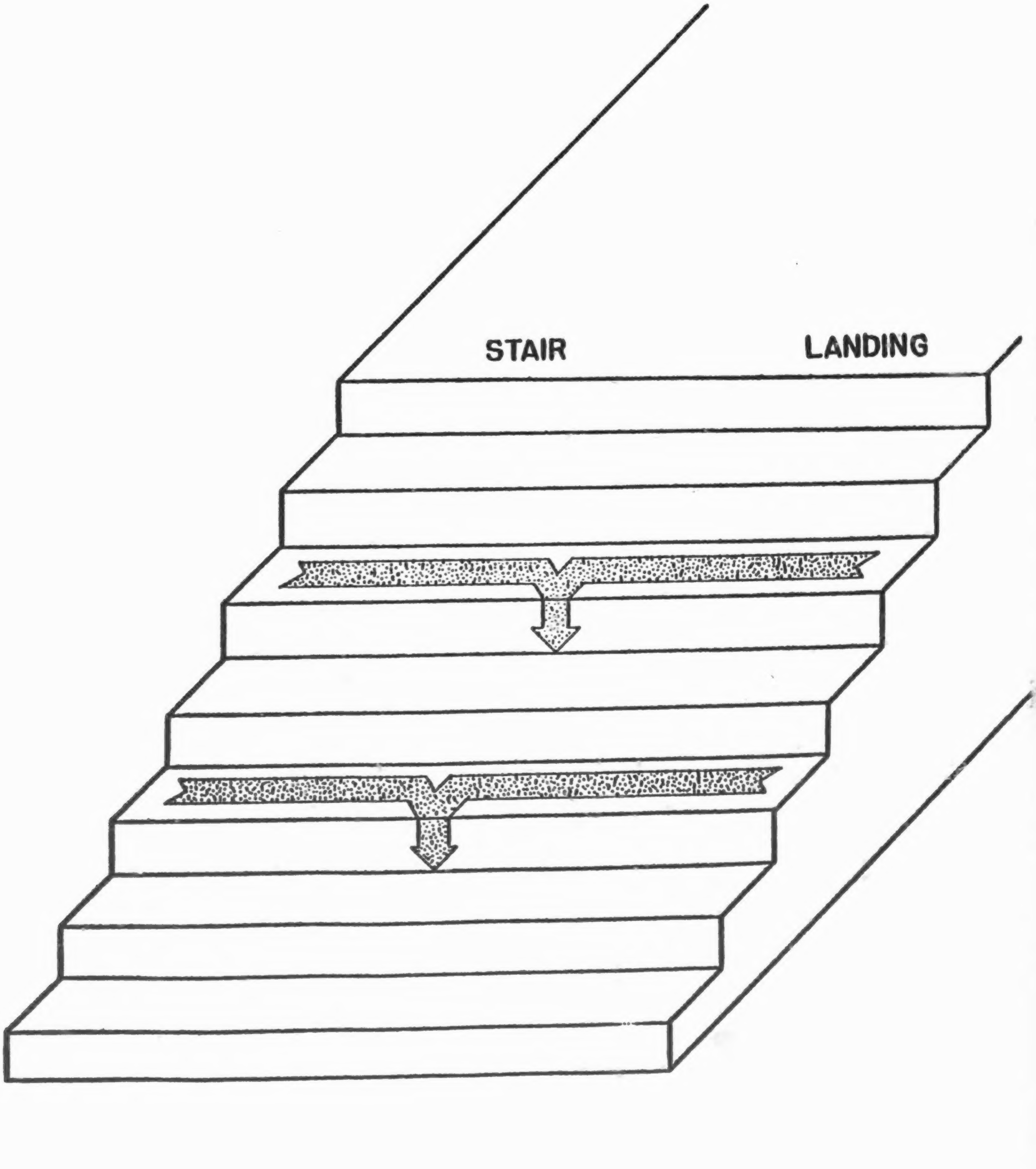
SWEEPING GYMNASIUMS


BEGIN 1
BEGIN 2

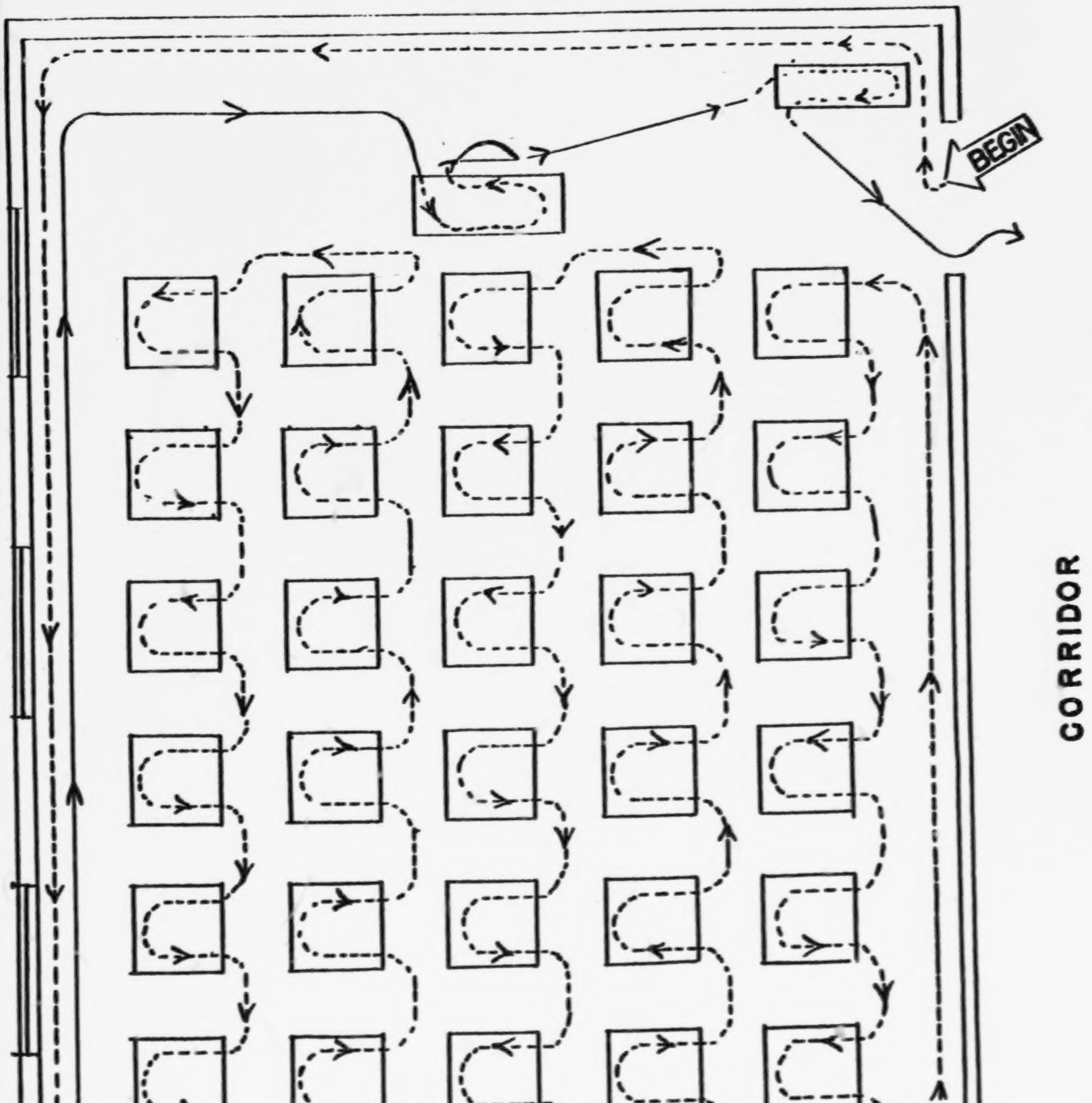
STAIRS WITH ONE OPEN END


WALL
STAIR
LANDING

STAIRS WITH BOTH ENDS OPEN


STAIR
LANDING

DUSTING A CLASSROOM


BEGIN
CORRIDOR

- - - - - - - - - - - WALKING AND DUSTING

———————— WALKING

CHAPTER 5

PEST CONTROL

PEST CONTROL

Insects and rodents are vectors or carriers of communicable diseases. They are often an indicator of filth. When they are controlled, a link in the chain of disease transmission may be broken.

It is possible to maintain a school premise and plant in such a condition that the insect and rodent vectors of disease will be effectively controlled. There are three fundamental methods of achieving this control:

1. Good sanitation practiced as a general rule throughout the school premises.
2. The proper use of insecticides and rodenticides
3. Structural methods

The latter include the general maintenance and care of buildings, and prompt repair of cracks which appear in exterior and interior walls, thereby blocking avenues through which insects and rodents could gain access to the building.

HARBORAGE FOR PESTS

The basic means of preventing an infestation of insect and rodents is to maintain good sanitary standards throughout the school plant and premises. It follows that where a premise is clean there will be fewer problems with these disease vectors. Focal points where occur dirt, food, and harborage favorable to insect and rodent populations are cafeterias, lunchrooms, kitchens, toilets, washrooms, basements, mop storage rooms, and locker rooms. Concerning the latter, and particularly the lockers themselves, it is important that a program of education be continuously conducted to instruct students on the importance of keeping their lockers clean, free of food and dirty clothing.

Basement areas where fuel and tools are stored and where the furnace is located are natural places for insect and rodent harborage. It is important that custodians' operations be checked at regular intervals to insure that the basement rooms are kept in a litter free condition.

An important aid in maintaining sanitary conditions throughout the school plant is the provision of good lighting. Pests do not care for bright light.

The kitchen area presents special problems in insect and rodent control. It is important that food be stored in tight containers. After each meal, the entire kitchen should be thoroughly cleaned.

Washrooms and shower rooms should be thoroughly cleaned to remove accumulations of dirt, especially in the corners of the room. Areas under lockers should be swept frequently or vacuumed.

No deposit of trash, brush, wood, or other material which may provide harborage for rodents should be allowed to accumulate on the premises outside the school building. Arrangements should be made, therefore, for the prompt removal of accumulations resulting from school clean-up campaigns. It is important to specify that contractors doing construction or alterations leave the premises free of litter, lunch wrappings, and other refuse after completing the days work.

CHEMICAL CONTROL

1. Flies

Effective fly control should be based on effective environment and sanitary procedures rather than chemical treatment along. Cleanliness and the elimination of fly breeding places in a community are two important control factors. The correct role of the insecticide in a fly control program is to supplement or aid the improvements in the physical environments. To kill flies with the insecticide, the best method is as follows: Close the windows and doors and point the spray unit, hand or power type, toward the ceiling of the infested room. Move about the room pumping a heavy mist which will then fill the room. After ten or fifteen minutes the flies will be dead or paralyzed and should be swept up and burned, if possible. Remember, the spray will explode near an open flame.

In the control of flies, spraying of walls and ceilings with a 5% solution of DDT may afford protection for a period of time. However, in many areas flies have developed immunity to this insecticide and when it is no longer effective, use of another agent such as dieldrin, DDVP, or malathion may be satisfactory. Care should be exercised to insure that in the application of insecticide sprays food stuffs are properly protected to avoid contamination. Another fly control agent as an alternate to DDT is diazinon. Diazinon cords or strings 1/32" in diameter, impregnated with insecticide by immersion in 10% and 25% diazinon-xylene solutions, have been effective against DDT-resistant houseflies. It has also been found that cords impregnated with a 25% diazinon solution have given a higher degree of control than those impregnated with a 10% concentration. Diazinon has been effective on the larva of the housefly. Should they be noticed in the organic soaked ground around garbage cans, one pint of 0.25% diazinon solution applied to a small area can be used as a method of control.

2. Roaches

Spray the insecticide into cracks, crevices, or openings in which roaches may be hidden or be able to pass through. The hiding and breeding places of roaches are found under table tops, cabinet tops, drainboards, and closets. Permit the insecticide to remain overnight or for a stated period of time on the spaces before removing. Spray thoroughly and often.

Roach control chemicals include emulsions and solutions of chlordane (effective in some areas), malathion, diazinon, and sodium fluoride powder (blue) mixed with flour and pyrethrum on a 50-40-10 ratio. This latter agent must be used with great care to avoid its ingestion by person or animals and its coming in contact with food.

A suggested method for applying liquid insecticide for roach control is the so called band or perimeter method. In this approach, the corners of rooms to be treated are painted with an emulsion of the agent. A four-inch paint brush and a tin can holder for the emulsion may be used and a band of insecticide is painted from the corner of the room, four inches up on the baseboard, and four inches out on the floor. This band should be continued around the windows and doors so that an unbroken chain of insecticide is formed around the perimeter of the room. This is augmented by the use of a hand sprayer to reach areas behind heavy objects that cannot be readily moved. When insects emerge from their hiding places in search of food, they will often have to cross the insecticide barrier at some point and in doing so, will absorb insecticide. For heavy infestations and for deroaching areas where the band method alone may not be effective, fogging with pyrethrum or allethrin may be helpful. Pyrethrum and allethrin are effective insecticides but have little or no residual effect. Therefore, it is essential that they come in contact with the insects wherever they may be hidden.

3. Ants

The small ant that lives in building structures can be exterminated if the patches and nesting places can be located. Use appropriate insecticide. Spray these areas liberally and often. Regular spraying will drive these pests outside. To kill ants in earth beds, follow the directions for killing them in the ant hills. Ordinarily, a few applications of one-gallon exterminator mixture for each ant hill will force the ant to move out.

The name of a few insecticides which have shown promise in the control of ants include: DDT, chlordane, benzene hexachloride, methoxychlor and lindane.

4. Bedbugs

Bedbug infestations in locker rooms may be controlled by spraying all surfaces of the interior and exterior of the lockers as well as the floor, walls, and ceilings of the locker rooms with a 5% solution of DDT. DDT has the advantage of being residual in its effect, which means that although the application will not kill the egg stage of the insect, when the insect emerges from the egg, the agent will still be present and will take effect. If immunity to DDT is noticed, a 0.5% solution of lindane should be tried.

5. Termites

Termites are commonly called white ants because they are whitish in color and live in colonies. However, they are not true ants, but are related to the cockroach family. As a matter of fact, ants are natural enemies of termites and will destroy them. A termite colony consists of one or more males, one or several queens, and a large number of workers and soldiers that do not have wings. For a short period of their lives, the kings and queens have fully developed wings. In the spring, and sometimes in the fall, these winged termites leave their nests and fly off to establish new colonies. After the termites have reached a new location, their wings break off.

The dry-wood termite makes its nest in wood and can gain entrance to the wood through cracks or breaks in the protective coating of the wood. The subterranean termites prefer the sandy soil of warm regions, but are not adverse to heavy clay soils. They live in the earth and in wood which is in contact with the earth. They feed upon wood which is in or on the ground. Sometimes they build tubes or covered runways from their galleries in the ground over wood, plaster, or cement to wood at higher levels. They feed within the cavity; they gnaw out, always retaining intact the outer protective shell of undamaged wood.

Unless the wood is damp or kept wet by leaky pipes, the termites cannot live in it; and if the passage back to the ground is closed, they will die after a time. The presence of termites may be detected by three means:

1. The termites shun daylight, but they can be observed as they swarm in the spring. They have white wings but their bodies are brown or black.
2. Sometimes the termites build little tubes of earth and wood along a wall to wood. Often they gain access to a building through cracks in the foundation.
3. Damaged wood may be found. Door casings may give way at a touch or the floor may begin to sag.

When termites are known to be infesting a building, the problem is to stop damage, to repair weakened timbers, and to prevent the return of the insects. It is recommended that a professional firm be called in to rid the building of the termites since the procedure is rather involved for a school custodian to undertake. The damage to the building should be repaired, and the commercial exterminator should take the necessary steps to prevent the return of the insects.

6. Rats

For rodent control, it may be necessary to choose between trapping, the use of rodenticides, or a combination of both. Trapping has an advantage in that when the animal is caught it may be removed from the premises and does not cause an odor problem, which may often occur if a poisoned animal falls back into a harborage point in walls, floors, or ceilings. However, trapping is also the least efficient rodent control measure because it reaches only a small percentage of the total rodent population.

Discovery of anticoagulant drugs ranks as the biggest boom to rat elimination in recent years. These drugs, such as diphacin, fumarin, pival and warfarin, reduce or prevent blood clotting and result in fatal internal bleeding. When mixed with grain or cereal-type bait, this poison attracts rats. Anticoagulants don't kill by a single dose, but must be fed upon several times over a period of days. This produces a cumulative effect which ultimately kills. The amount of poison in one dose of the bait is low, so accidentally feeding on it by children, pets or livestock rarely causes harm. Anticoagulant baits are thus effective and fairly safe.

A new chemical discovery called RATICATE holds great promise. Developed and tested at Tavolek Laboratories of Fort Washington, Pennsylvania, it went on the market in late 1964. Its action differs from other rodenticides and kills after a single feeding, usually within 15 minutes to four hours after ingestion. Despite its lethal effect on rats, it produces no deaths in domestic pets and farm animals.

When rodenticides are used, a chart should be made to show the location of the baits. This route should be checked at regular intervals of a day or more after the application to replinish the baits, if they have been removed, and to remove any dead rodents near the bait station.

Rodent control may be achieved by the custodian and his forces. It is, however, sometimes helpful for the larger school to contract with a reputable pest control agency so that advice or its services may be utilized.

CAUTION

It should be remembered in using all insecticides and rodenticides that they are poisonous in nature and should, therefore, be applied and handled with care. Care should be exercised to see that the skin is not in contact with these agents, that following their use one showers thoroughly and discards or washes the clothes he wore while using the chemicals.

Normal control of insects and rodents with the use of chemical poisons can be accomplished by the custodian or his forces providing they have received proper instruction in large scale application methods. For this reason it is important that advantage be taken of short courses which are offered by the State or local Health Department, or by the Public Health Service on the control of insects and rodents through the use of chemical agents. However, the use of highly toxic poisons such as 1080 or cyanide should be done only by licensed professionals. There are two publications which should be on the shelves of every school principal and custodian. These are: Operational Memoranda on Economic Poisons and Clinical Memoranda on Economic Poisons, U. S. Government Printing Office, Washington, D. C., Publication No. 476, Price, 55 cents. The latter contains much useful information on physiological effects of insecticides and antidotes to them. Both are published by the Communicable Disease Center, U. S. Public Health Service, Atlanta, Georgia.

D. PHYSICAL CONTROL

Insects and rodents should be denied entrance to the school plant, which may be facilitated through closing unnecessary openings. Windows and doors should be screened with 16 mesh screening, and unnecessary openings in the school wall should be sealed. Such openings as window wells, the ends of downspouts, air spaces or other breaks in the exterior wall should be covered by 1/4 inch hardware cloth. It is possible to achieve rodent control also by the use of concrete curtain walls, but as this method is a special technique, it will not be discussed at this point. Reference for details should be obtained by consulting brochures on rat control published by either the Department of Agriculture, the U. S. Public Health Service, or local and state public health agencies. It is most important in the structural method of insect and rodent control that the school plant be kept in good repair. When cracks appear in the walls, they should be promptly closed and damage to screening should be repaired. Hard surface cover of crawl spaces with a thin concrete slab or layer of asphalt will prevent the entrance of rodents.

APPENDIX A

ACTUAL USE COST
of
DILUTED CONCENTRATE

Page 1 of 3

Dilution-Oz/Gal —		½oz/gl	1oz/gl	2oz/gl	3oz/gl	4oz/gl	5oz/gl	6oz/gl	8oz/gl
Concentrate:Water ratio —		1:256	1:128	1:64	1:43	1:32	1:26	1:21	1:16
Concentrate cost per gallon	$ 1.00	.0039	.0078	.0156	.0234	.0312	.0390	.0468	.0625
	1.05	.0041	.0082	.0164	.0246	.0328	.0410	.0492	.0656
	1.10	.0043	.0086	.0172	.0258	.0344	.0430	.0516	.0688
	1.15	.0045	.0090	.0180	.0270	.0360	.0450	.0540	.0719
	1.20	.0047	.0094	.0188	.0282	.0376	.0470	.0564	.0750
	1.25	.0049	.0098	.0196	.0294	.0392	.0490	.0588	.0781
	1.30	.0051	.0102	.0204	.0306	.0408	.0510	.0612	.0813
	1.35	.0053	.0106	.0212	.0318	.0424	.0530	.0636	.0844
	1.40	.0055	.0110	.0220	.0330	.0440	.0550	.0660	.0875
	1.45	.0057	.0113	.0226	.0339	.0452	.0565	.0678	.0906
	1.50	.0059	.0117	.0234	.0351	.0468	.0585	.0702	.0938
	1.55	.0061	.0121	.0242	.0363	.0484	.0605	.0726	.0969
	1.60	.0063	.0125	.0250	.0375	.0500	.0625	.0750	.1000
	1.65	.0065	.0129	.0258	.0387	.0516	.0645	.0774	.1031
	1.70	.0067	.0133	.0266	.0399	.0532	.0665	.0798	.1063
	1.75	.0069	.0137	.0274	.0411	.0548	.0685	.0822	.1094
	1.80	.0070	.0141	.0282	.0423	.0564	.0705	.0846	.1125
	1.85	.0073	.0145	.0290	.0435	.0580	.0725	.0870	.1156
	1.90	.0074	.0148	.0296	.0444	.0592	.0740	.0888	.1188
	1.95	.0076	.0152	.0304	.0456	.0608	.0760	.0912	.1219
	2.00	.0078	.0156	.0312	.0468	.0624	.0780	.0936	.1250
	2.05	.0080	.0160	.0320	.0480	.0641	.0801	.0961	.1281
	2.10	.0082	.0164	.0328	.0492	.0656	.0820	.0984	.1313
	2.15	.0084	.0168	.0336	.0504	.0672	.0840	.1008	.1344
	2.20	.0086	.0172	.0344	.0516	.0688	.0860	.1032	.1375
	2.25	.0088	.0176	.0352	.0528	.0704	.0880	.1056	.1406
	2.30	.0090	.0180	.0360	.0540	.0720	.0900	.1080	.1438

ACTUAL USE COST
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DILUTED CONCENTRATE

Dilution-Oz/Gal	---	½oz/gl	1oz/gl	2oz/gl	3oz/gl	4oz/gl	5oz/gl	6oz/gl	8oz/gl
ncentrate:Water ratio-		1:256	1:128	1:64	1:43	1:32	1:26	1:21	1:16
Concentrate $ cost per gallon	2.35	.0092	.0184	.0367	.0547	.0734	.0904	.1119	.1469
	2.40	.0094	.0188	.0375	.0558	.0750	.0923	.1143	.1500
	2.45	.0096	.0191	.038	.0570	.0766	.0942	.1166	.1531
	2.50	.0098	.0195	.0391	.0581	.0781	.0962	.1190	.1563
	2.55	.0100	.0199	.0398	.0593	.0797	.0981	.1214	.1594
	2.60	.0102	.0203	.0406	.0605	.0813	.1000	.1238	.1625
	2.65	.0103	.0207	.0414	.0616	.0828	.1019	.1262	.1656
	2.70	.0105	.0211	.0422	.0628	.0844	.1038	.1286	.1688
	2.75	.0107	.0215	.0430	.0640	.0859	.1058	.1310	.1719
	2.80	.0109	.0219	.0438	.0651	.0875	.1077	.1333	.1750
	2.85	.0111	.0223	.0445	.0663	.0891	.1096	.1357	.1781
	2.90	.0113	.0227	.0453	.0674	.0906	.1115	.1381	.1813
	2.95	.0115	.0230	.0461	.0686	.0922	.1135	.1405	.1844
	3.00	.0117	.0234	.0469	.0698	.0936	.1154	.1429	.1875
	3.05	.0119	.0238	.0477	.0709	.0953	.1173	.1452	.1906
	3.10	.0121	.0242	.0484	.0721	.0969	.1192	.1476	.1938
	3.15	.0123	.0246	.0492	.0733	.0984	.1212	.1500	.1969
	3.20	.0125	.0250	.0500	.0744	.1000	.1231	.1524	.2000
	3.25	.0127	.0254	.0508	.0756	.1016	.1250	.1548	.2031
	3.30	.0129	.0258	.0516	.0767	.1031	.1269	.1571	.2063
	3.35	.0131	.0262	.0523	.0779	.1047	.1288	.1595	.2094
	3.40	.0133	.0266	.0531	.0791	.1063	.1308	.1619	.2125
	3.45	.0135	.0270	.0539	.0802	.1078	.1327	.1643	.2156
	3.50	.0137	.0273	.0547	.0814	.1094	.1346	.1667	.2188
	3.55	.0139	.0277	.0555	.0826	.1109	.1365	.1690	.2219
	3.60	.0141	.0281	.0563	.0837	.1125	.1385	.1714	.2250
	3.65	.0143	.0285	.0570	.0849	.1141	.1404	.1738	.2281

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ACTUAL USE COST
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DILUTED CONCENTRATE

Page 3 of 3

Dilution -Oz/Gal--		½oz/gl	1oz/gl	2oz/gl	3oz/gl	4oz/gl	5oz/gl	6oz/gl	8oz/gl
Concentrate:Water ratio-		1:256	1:128	1:64	1:43	1:32	1:26	1:21	1:16
Concentrate $ cost per gallon	3.70	.0145	.0289	.0578	.0861	.1156	.1423	.1762	.2313
	3.75	.0146	.0293	.0586	.0872	.1172	.1442	.1786	.2344
	3.80	.0148	.0297	.0594	.0884	.1188	.1462	.1810	.2375
	3.85	.0150	.0301	.0602	.0895	.1203	.1481	.1833	.2406
	3.90	.0152	.0305	.0609	.0907	.1219	.1500	.1857	.2438
	3.95	.0154	.0309	.0617	.0919	.1234	.1519	.1881	.2469
	4.00	.0156	.0313	.0625	.0930	.1250	.1538	.1905	.2500
	4.05	.0158	.0316	.0633	.0942	.1266	.1558	.1929	.2531
	4.10	.0160	.0320	.0641	.0953	.1281	.1577	.1952	.2563
	4.15	.0162	.0324	.0648	.0965	.1297	.1596	.1976	.2594
	4.20	.0164	.0328	.0656	.0977	.1313	.1615	.2000	.2625
	4.25	.0166	.0332	.0664	.0988	.1328	.1635	.2024	.2656

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